Arithmetic for Everyday Use

Book I

by

G. F. Pew
and
W. H. Jennings

CURRICULUM

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135
P51
bk.1

CURR HIST

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TO THE STUDENT

1. Study the Instructional Material Given with Each Unit.

Basically, arithmetic is a matter of addition, subtraction, multiplication and division. Commercial arithmetic involves the application of these fundamental operations to business transactions. It is obvious, therefore, that you must become familiar with business practices in order to apply the principles of arithmetic to business transactions.

Each unit in this workbook illustrates and provides practice in applying basic operations to business problems. A minimum of instructional material, which is intended to provide a basis for class-room discussion on the topic, is followed immediately by a wealth of exercise material. As far as has been considered feasible, the applications have been chosen from assignments likely to be encountered by the student entering business in any locality.

2. Would Be Acceptable to an Employer.

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y careful in making figures; illegible figures cause errors.
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3. ns on the Blank Sheets Provided at the Back of the

4. for Each Unit Before Proceeding to the Next Unit.

5. ble for Review Purposes.

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pr Of course, the effectiveness of your review will depend upon
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UNIT 1

FUNDAMENTAL OPERATIONS WITH WHOLE NUMBERS

LEGIBLE FIGURES

Neat and legibly written figures improve the accuracy of your simple calculations and improve the general appearance of your records.

Legibility depends upon the form and style of the figures.

Neatness depends upon the uniformity of slant and size of the figures.

The figures appearing in the column on the left side of the page below are written legibly and neatly. Their main characteristics may be easily observed in the line of large figures appearing on the next line.

1 2 3 4 5 6 7 8 9 0

1. Write the figures appearing in the left column in each of the three blank columns. Try to make each succeeding copy better than the one before.

		(1)	(2)	(3)
	123456789			
	234567890			
	345678901			
	456789012			
	567890123			
	678901234			
	789012345			
	890123456			
	901234567			
	890123456			
	789012345			
	678901234			
	567890123			
	456789012			
	345678901			
	234567890			
	123456789			

213416

2. In the spaces provided below, copy the columns of figures and add. Make neat and legible figures. Check your addition for accuracy.

(1)	(2)	(3)	(4)	(5)
8456.38	4353.75	8479.32	7468.23	4286.98
3573.75	9469.37	3763.84	2984.67	8637.43
5495.49	5398.62	9827.55	7648.29	9787.89
9536.84	3877.98	4685.69	3967.46	6398.79
7738.36	6938.45	7993.97	8285.63	8688.73
4897.67	7973.69	2974.82	9768.76	7788.99

(6)	(7)	(8)	(9)	(10)
6748.39	9937.81	7586.92	8743.85	4392.44
5436.45	7893.58	6375.87	2827.87	8565.29
7386.92	5293.93	2945.27	2958.78	2578.65
6938.37	6749.55	6986.74	2949.53	8479.32
5497.36	8565.29	9673.78	6928.25	3899.88
4392.44	7973.69	9789.33	8479.32	7973.69

(1)	(2)	(3)	(4)	(5)

(6)	(7)	(8)	(9)	(10)

1. The following table represents the sales of the four departments of a department store for the first week of September, 19—. Find the total for each department for the week and also the total sales for each day. The sum of the totals for all departments should equal the sum of the totals for each day.

19— DATE	DEPT. A	DEPT. B	DEPT. C	DEPT. D	TOTAL
Sept. 1	$ 848 60	$ 758 40	$ 1075 00	$ 725 50	$
2	926 85	642 87	916 45	870 27	
3	1063 45	875 92	1127 30	926 85	
4	863 42	978 84	854 78	1060 25	
5	963 27	542 60	728 96	840 95	
6	1126 38	1063 70	962 47	925 76	
	$	$	$	$	$

2. The following tabulation shows the sales made by the several clerks in a store for one week. Find the total sales for each day and the total for each clerk for the week. The grand totals should agree.

CK*	MON.	TUES.	WED.	THUR.	FRI.	SAT.	TOTAL
A	246 60	198 75	98 27	296 37	250 40	395 36	
B	365 42	226 86	152 63	346 28	178 63	369 45	
C	182 63	245 10	110 60	295 80	312 75	305 90	
D	216 40	195 80	96 52	156 75	202 90	327 63	
E	195 70	263 92	106 73	215 35	276 36	401 25	
F	422 67	387 69	217 44	378 63	312 75	430 70	
G	93 70	115 30	63 80	125 65	187 39	216 47	
H	196 32	212 60	96 36	225 80	187 63	327 80	
I	141 15	197 82	104 80	256 75	163 75	198 20	
J	243 35	216 34	158 70	322 16	217 63	260 30	
K	185 00	190 36	97 40	264 18	117 89	265 86	
L	326 75	117 20	169 23	211 10	176 30	179 48	

*Clerk

ADDITION OF WHOLE NUMBERS

1. Rule the necessary columns and tabulate the following data representing the number of cases of soft drinks delivered by a manufacturer in one week. Your figures must be legible and neat. Monday: Truck No. 1, 356 cases; Truck No. 2, 425 cases; Truck No. 3, 415 cases; Truck No. 4, 248 cases. Tuesday: No. 1, 410; No. 2, 360; No. 3, 280; No. 4, 420. Wednesday: No. 1, 360; No. 2, 290; No. 3, 165; No. 4, 216. Thursday: No. 1, 128; No. 2, 314; No. 3, 304; No. 4, 198. Friday: No. 1, 206; No. 2, 198; No. 3, 216; No. 4, 300. Saturday: No. 1, 304; No. 2, 285; No. 3, 290; No. 4, 410.

Find the total for each truck, the total for each day, and the grand total. Check your work for accuracy.

2. Tabulate the following statistics relating to the value of lands, buildings, and equipment of the secondary schools of a large Canadian city for the year 19—. Total and prove your addition. Legibility and neatness are important. Kennedy Collegiate Institute—Lands, $49,590; Buildings, $533,301; Equipment, $25,000. Patterson Collegiate Institute—Land, $27,600; Buildings, $379,696; Equipment, $20,000. Walkerville Collegiate Institute—Land, $60,820; Buildings, $456,506; Equipment, $12,000. Sandwich Collegiate Institute—Land, $10,580; Buildings, $208,683; Equipment, $7,500. Lowe Vocational School—Land, $30,940; Buildings, $888,102; Equipment, $120,000.

1. In the spaces below, copy the following figures and subtract as indicated.

(1) 764,278 − 678,919
(2) 809,043 − 79,508
(3) 840,025 − 706,021
(4) 729,038 − 527,059
(5) 564,237 − 56,423

(6) 142,826 − 91,761
(7) 110,528 − 63,079
(8) 837,942 − 665,199
(9) 764,275 − 109,209
(10) 917,409 − 198,674

(1)	(2)	(3)	(4)	(5)

(6)	(7)	(8)	(9)	(10)

2. Subtract the following figures in succession, as shown in Column 1. Check your work before continuing with each succeeding subtraction.

(1)	(2)	(3)	(4)	(5)
4827563 1639849	9739640 7126375	6500300 1499237	9837009 2596318	6370201 1491992
3187714 1986348	1927309	3263020	4063709	2630701
1201366 976039	663427	806379	1560932	983279
225327				

3. Calculate the balance in each of these two problems. Write the balance on the last line of the Payments column opposite the letter B, and show the totals.

(1)

DATE	RECEIPTS		PAYMENTS	
Sept. 1	$ 1428	96	$ 372	43
2	2176	32	1563	50
3	1417	38	976	90
4	2047	52	1326	75
			B	
Totals	$		$	

(2)

DATE	RECEIPTS		PAYMENTS	
Sept. 6	$ 1829	70	$ 862	45
9	1979	65	1063	80
10	2176	34	2063	00
11	1789	75	449	63
			B	
Totals	$		$	

To determine the balance of a bank account, add the deposits and subtract the withdrawals. In the following exercise, withdrawals are made by cheque. Insert the balances as indicated. Check your work carefully.

(1)

DATE	PARTICULARS	AMOUNT
Sept. 1	Balance on hand	$2,482.17
1	Deposit	396.24
	Balance	
2	Cheque No. 1	526.30
	Balance	
3	Deposit	1,126.80
	Balance	
4	Cheque No. 2	635.40
4	Cheque No. 3	476.28
	Balance	
5	Deposit	362.80
	Balance forward	

(2)

DATE	PARTICULARS	AMOUNT
Sept. 8	Balance forwarded	
8	Deposit	875.00
	Balance	
9	Cheque No. 4	963.85
	Balance	
10	Deposit	496.30
	Balance	
11	Deposit	685.25
	Balance	
12	Cheque No. 5	627.50
12	Cheque No. 6	382.90
	Balance forward	

(3)

Sept. 15	Balance forwarded	
15	Cheque No. 7	$525.00
	Balance	
16	Deposit	475.60
	Balance	
17	Deposit	263.95
	Balance	
18	Cheque No. 8	532.65
18	Cheque No. 9	216.70
18	Cheque No. 10	97.32
	Balance forward	

(4)

Sept. 22	Balance forwarded	
22	Deposit	$169.28
	Balance	
23	Cheque No. 11	99.80
23	Cheque No. 12	125.62
	Balance	
24	Deposit	1,063.45
24	Deposit	59.27
	Balance	
25	Cheque No. 13	496.35
	Balance	

1. Complete the following Statement of Profit and Loss of the several departments of a business. To find the Gross Profit, subtract the Cost of Goods Sold from the Sales. To find the Net Profit, subtract the Operating Expenses from the Gross Profit. The Net Profit for all departments should equal the total of the net profits for each department.

	DEPT. A		DEPT. B		DEPT. C		DEPT. D		TOTAL
Sales	3764	70	2768	40	5246	38	2693	15	
Cost of Goods Sold	2016	30	1369	50	3276	30	1163	25	
Gross Profit									
Operating Expenses	526	34	642	75	1236	90	942	77	
Net Profit									

2. From the tabulation of Sales for the X Company for the years 1954 and 1955, find the difference for each month and insert in the Increase column or the Decrease column as the case may be. Prove by finding the total difference between the sales for 1954 and 1955 and compare with the total difference between the increases and decreases. If your work is correct, these differences should be the same.

MONTH	SALES 1954		SALES 1955		INCREASE	DECREASE
January	12640	75	13246	30		
February	11462	63	10275	86		
March	16427	96	17363	42		
April	12396	72	13463	80		
May	10427	55	9637	92		
June	14632	71	15633	42		
July	14777	63	14763	25		
August	10742	11	9632	84		
September	15638	20	16362	96		
October	12711	30	12966	36		
November	13966	50	14785	43		
December	19826	78	20632	90		
Totals						

MAKING CHANGE—In making change, the usual practice is to give change in the largest denominations possible. An adding process is generally used. For example, if a $10 bill is given for a $3.48 purchase, the clerk will offer two cents to make the $3.48 three-fifty, 50 cents to make the $3.50 four dollars, a one dollar bill to make the $4.00 five dollars, and a five dollar bill to make the $5.00 ten dollars.

In the tabulation below, write in the number of coins and bills required according to the plan outlined above. Prove by finding the total difference between the Amount given and the Amount of Purchase, and compare with the figure appearing in the Amount of Change column.

1.

Amount Given		Amount of Purchase		1c	5c	10c	25c	50c	$1	$2	$5	$10	Amount of Change	
10	00	2	98											
5	00	1	40											
20	00	11	22											
10	00	6	30											
10	00	4	53											
5	00	1	74											
20	00	1	42											
15	00	13	17											
10	00	7	62											
25	00	23	77											

2.

Amount Given		Amount of Purchase		1c	5c	10c	25c	50c	$1	$2	$5	$10	Amount of Change	
10	00	3	52											
5	00		75											
20	00	4	86											
10	00	2	74											
5	00	1	26											
10	00	3	34											
5	00		92											
20	00	18	74											
15	00	11	55											
35	00	31	09											

Multiplication of Whole Numbers

Multiplication is really another form of addition. For example, 4 × 125 is the same as 125 + 125 + 125 + 125. The result of multiplying two numbers is known as the product. Multiplication of numbers up to 12 should be done in one operation.

Example—
```
24678
   12
------
296136
```

It is obvious, therefore, that multiplication tables should be thoroughly learned.

1. Multiply as indicated below.

1748967 8	6352985 9	6724693 11	5384296 12
9	11	12	8
11	12	8	9

2. When multiplying by numbers up to 12, as in the following extensions, the products should be calculated and put down directly in the Amount columns. Total the Amount columns.

Quan.	Description	Amount		Quan.	Description	Amount	
11	yds. @ 1.45 yd.			342	lbs. @ .07 lb.		
9	yds. @ 2.63 yd.			163	lbs. @ .08 lb.		
8	yds. @ 3.47 yd.			265	lbs. @ .12 lb.		
12	yds. @ 2.78 yd.			246	lbs. @ .11 lb.		
7	yds. @ 1.69 yd.			98	lbs. @ .09 lb.		
12	yds. @ 2.43 yd.			87	lbs. @ .12 lb.		
11	yds. @ 4.75 yd.			59	lbs. @ .11 lb.		
9	yds. @ 3.62 yd.			149	lbs. @ .08 lb.		
7	yds. @ 4.82 yd.			264	lbs. @ .09 lb.		
12	yds. @ 1.96 yd.			98	lbs. @ .07 lb.		
11	yds. @ 3.86 yd.			268	lbs. @ .12 lb.		
9	yds. @ 2.35 yd.			196	lbs. @ .11 lb.		
	Total				Total		

MULTIPLICATION OF WHOLE NUMBERS

When multiplying by numbers which require more than one line or operation, it is important to keep the figures in proper alignment. This will help to avoid errors in adding.

EXAMPLE

$$\begin{array}{r} 42869 \\ 365 \\ \hline 214345 \\ 257214 \\ 128607 \\ \hline 15647185 \end{array}$$

1. Keeping figures carefully aligned, multiply as indicated below. Be accurate.

37569 487	69278 596	98764 897	60429 789

To multiply a number by 10, it is necessary only to add "0" to the number. For example, 4625 × 10 = 46250. Similarly 4625 × 100 = 462500, and 4625 × 1000 = 4625000.

Note also the following example done by cross multiplication: 4625 × 30 = 138750 and 4625 × 1200 = 5550000.

The example below illustrates how larger multipliers ending in zeros may be used.

$$\begin{array}{l} 3252 \\ \quad\cdot 27000 \\ \hline 22764000 \\ 6504 \\ \hline 87804000 \end{array}$$

2. Multiply the figures given below.

(1) 67389 × 30		(9) 47693 × 300	
(2) 76935 × 50		(10) 64275 × 110	
(3) 97382 × 600		(11) 63978 × 90	
(4) 47329 × 120		(12) 54693 × 1200	
(5) 96384 × 40		(13) 48765 × 400	
(6) 73263 × 70		(14) 39638 × 20	
(7) 19638 × 80		(15) 46379 × 3000	
(8) 26342 × 200		(16) 21634 × 900	

MULTIPLICATION OF WHOLE NUMBERS

SHORT-CUT METHODS—The following examples illustrate some well-known short-cuts in multiplication.

1. To multiply a number by 99, multiply first by 100 (add two zeros) and subtract the number.

$$\begin{array}{rr} 524 \times 99 = & 52400 \\ & -524 \\ \hline & 51876 \end{array}$$

2. To multiply a number by 101, multiply first by 100 and add the number.

$$\begin{array}{rr} 524 \times 101 = & 52400 \\ & +524 \\ \hline & 52924 \end{array}$$

3. To multiply a number by 25, multiply first by 100 and then divide the result by 4.

$$524 \times 25 = 52400 \div 4 = 13100$$

4. To multiply a number by 125, multiply first by 100 and then add one-fourth of the product.

$$\begin{array}{rr} 524 \times 125 = & 52400 \\ & +\ 13100 \\ \hline & 65500 \end{array}$$

5. The same principle as used in (3) and (4) above may be applied to multiplication by 50, 150, 250, 1500, etc.

Using short-cut methods, multiply as follows:

1. 3275 × 99	2. 4675 × 99	3. 20738 × 99	4. 17693 × 99
5. 6375 × 999	6. 2175 × 999	7. 5283 × 999	8. 7263 × 999
9. 7283 × 101	10. 2045 × 101	11. 6396 × 101	12. 9382 × 101
13. 3275 × 1001	14. 4697 × 1001	15. 5286 × 1001	16. 6973 × 1001
17. 2424 × 50	18. 4836 × 150	19. 2864 × 250	20. 8638 × 1500

Use short-cut methods in the following assignments.

1. 978 × 25
2. 6384 × 25
3. 5968 × 25
4. 2684 × 25
5. 6384 × 125
6. 9784 × 125
7. 2684 × 125
8. 5968 × 125
9. 1762 × 50
10. 9684 × 50
11. 1262 × 50
12. 6344 × 50
13. 5632 × 150
14. 7688 × 150
15. 1548 × 150
16. 2684 × 150
17. 9783 × 99
18. 6547 × 101
19. 2964 × 25
20. 4248 × 125
21. 3963 × 999
22. 4271 × 1001
23. 8262 × 50
24. 3752 × 150
25. 2636 × 250
26. 4444 × 250
27. 6264 × 250
28. 4636 × 250
29. 1224 × 1500
30. 1468 × 1500
31. 2736 × 1500
32. 1616 × 1500
33. 1001 × 25
34. 1001 × 99
35. 1001 × 101
36. 1001 × 125

MULTIPLICATION OF WHOLE NUMBERS

When multiplying by numbers containing zeros, be careful with the alignment of each succeeding line of multiplication.

EXAMPLE 1—32564 × 206

$$\begin{array}{r} 32564 \\ 206 \\ \hline 195384 \\ 651280 \\ \hline 6708184 \end{array}$$

EXAMPLE 2—24635 × 2006

$$\begin{array}{r} 24635 \\ 2006 \\ \hline 147810 \\ 4927000 \\ \hline 49417810 \end{array}$$

NOTE: (1) The zero or zeros are merely brought down in alignment with the multiplier.
(2) Multiplication with the 2 begins in a position aligned with the 2.

Complete the following multiplications. Keep the figures properly aligned.

1. $\begin{array}{r} 26852 \\ 304 \\ \hline \end{array}$

2. $\begin{array}{r} 17964 \\ 508 \\ \hline \end{array}$

3. $\begin{array}{r} 27968 \\ 908 \\ \hline \end{array}$

4. $\begin{array}{r} 40603 \\ 709 \\ \hline \end{array}$

5. $\begin{array}{r} 72695 \\ 4006 \\ \hline \end{array}$

6. $\begin{array}{r} 97106 \\ 7008 \\ \hline \end{array}$

7. $\begin{array}{r} 86432 \\ 9009 \\ \hline \end{array}$

8. $\begin{array}{r} 64965 \\ 7006 \\ \hline \end{array}$

9. $\begin{array}{r} 589634 \\ 20608 \\ \hline \end{array}$

10. $\begin{array}{r} 926735 \\ 50607 \\ \hline \end{array}$

11. $\begin{array}{r} 7896375 \\ 70809 \\ \hline \end{array}$

12. $\begin{array}{r} 378965 \\ 30056 \\ \hline \end{array}$

13. $\begin{array}{r} 863794 \\ 56009 \\ \hline \end{array}$

14. $\begin{array}{r} 973275 \\ 40009 \\ \hline \end{array}$

1. Complete the extensions and find the total of the following bill. Use short-cuts when possible.

QUANTITY	DESCRIPTION	PRICE		AMOUNT	
15	tons Anthracite — Stove size	26	50		
11	tons Anthracite — Egg size	25	50		
8	tons Anthracite — Chestnut size	26	00		
12	tons Coke — Stove size	18	25		
14	tons Coke — Egg size	18	00		
9	tons Coke — Pea size	17	75		
12	tons Pocahontas— Stove size	19	85		
13	tons Pocahontas— Egg size	19	60		
9	tons Pocahontas— Chestnut size	19	50		
12	tons Stoker	11	50		
	Total				

2. Complete the following payroll. Add the hours worked daily by each worker and place the total in the Total Hours column. Multiply the figure in the Total Hours column by the wages per hour to find the total earnings.

Prove your addition of hours worked by totalling for each day. The total for all the days should then be the same as the total of the Total Hours column. Total, also, the Total Earnings column.

WORKER	HOURS WORKED DAILY						TOTAL HOURS	WAGES PER HR.		TOTAL EARNINGS
	M	T	W	T	F	S				
A	8	7	9	6	9	9		1	20	
B	7	9	8	7	8	8		1	10	
C	8	8	9	7	9	6			90	
D	8	8	8	8	7	9		1	30	
E	9	9	8	10	7	8		1	35	
F	8	7	9	8	9	8		1	10	
G	9	8	7	10	7	6			90	
H	8	8	9	7	6	8		1	20	
Totals										

Division of Whole Numbers

For division as for multiplication, a thorough knowledge of the multiplication tables is necessary. Division of numbers up to 12 should always be done by short division.

The number by which you divide is called the *divisor;* the number divided by the divisor is called the *dividend;* the result of the division is called the quotient.

Do the following by short division:

1. 2 19958688 3 4	2. 2 2558088 3 4	3. 2 35925360 3 4
4. 2 25791624 3 4	5. 2 3407568 3 4	6. 2 25407360 3 4
7. 5 29524320 6 7	8. 5 136806810 6 7	9. 5 137643030 6 7
10. 5 96470220 6 7	11. 5 175888020 6 7	12. 5 181389180 6 7
13. 5 167229090 6 7	14. 5 134347080 6 7	15. 5 1014764940 6 7
16. 6 70966896 7 8	17. 6 67909632 7 8	18. 6 105175728 7 8

16.
8 | 177761520
9 |
10 |

17.
8 | 355523040
9 |
10 |

18.
8 | 117511920
9 |
10 |

19.
8 | 297962280
9 |
11 |

20.
8 | 595924560
9 |
11 |

21.
8 | 88665984
9 |
11 |

22.
9 | 513479736
11 |
12 |

23.
9 | 151648200
11 |
12 |

24.
9 | 227472300
11 |
12 |

25.
9 | 275999724
11 |
12 |

26.
9 | 144473868
11 |
12 |

27.
9 | 263999736
11 |
12 |

28.
5 | 155554560
6 |
7 |

29.
6 | 146254416
7 |
8 |

30.
7 | 426501936
8 |
9 |

31.
9 | 756213480
10 |
11 |

32.
10 | 895561920
11 |
12 |

33.
12 | 213331968
12 |
12 |

For divisors greater than 12, *long division* should be used.

EXAMPLE 1—Without Remainder.

```
      5 9 8 6
1 9)1 1 3 7 3 4
    9 5
    1 8 7
    1 7 1
      1 6 3
      1 5 2
        1 1 4
        1 1 4
```

Answer—5 9 6 8

EXAMPLE 2—With Remainder.

```
        7 0 2 8
6 5)4 5 6 8 4 4
    4 5 5
        1 8 4
        1 3 0
          5 4 4
          5 2 0
            2 4
```

Answer— 7 0 2 8 – 2 4

NOTE: (1) The remainder in any case must be less than the divisor.
(2) It is important to keep a true alignment of figures. Faulty alignment leads to errors.

Divide by long division.

1. 2 4)4 2 6 3 2	2. 3 5)1 2 9 6 8 3	3. 4 8)7 8 9 5 6
4. 1 7 5)2 4 8 9 1 6	5. 3 7 1)9 3 7 6 4 2	6. 1 6 3)1 0 0 3 0 2 7
7. 1 7 6 3)7 9 6 3 8 4 2	8. 2 9 8 7)9 6 3 0 0 9 2	9. 4 9 6 3)1 0 7 3 1 2 5 4

10. $246\overline{)169374}$

11. $8634\overline{)6431209}$

12. $365\overline{)758572}$

13. $658\overline{)4081692}$

14. $3798\overline{)9274267}$

15. $7804\overline{)9827624}$

16. $2931\overline{)2798794}$

17. $7342\overline{)48739826}$

18. $2863\overline{)10587635}$

19. $15631\overline{)2938421}$

20. $62458\overline{)10763254}$

21. $86987\overline{)8342632}$

AVERAGES—To find an average, divide the total concerned by the number of units for which the average is required. For example, if the total sales for six days is $3600, the average per day is $3600 divided by 6, or $600.

1. The following is a weekly summary of the sales of a drug store. Complete the calculations to determine the answers to the problems below the summary.

DAY	TOBACCO	SODA BAR	DRUGS	NOTIONS	TOTAL
Monday	$75.15	$40.20	$85.15	$120.70	
Tuesday	65.25	25.60	92.75	91.80	
Wednesday	83.00	38.45	110.70	130.00	
Thursday	97.25	54.80	87.35	110.80	
Friday	58.40	48.90	96.80	92.70	
Saturday	85.75	65.75	87.60	83.80	
Sunday	78.65	85.40	78.95	65.95	
Totals					

2. What is the average daily sale of:

(a) Tobacco?

(b) The Soda Bar?

(c) Drugs?

(d) Notions?

(e) All Departments?

(f) Each Department on Monday?

3. Which has the greater sales for the week, Tobacco or Drugs? By how much?

4. By how much does the largest daily sales figure exceed the smallest daily sales figure?

5. How much greater than the average daily sales figure was the highest daily sale?

6. If these sales were about average for the year (52 weeks), what are the estimated total sales for the year? (Complete the calculation in the space provided.)

Addition, Subtraction, Multiplication, Division

The following signs or symbols are used to indicate the operations in arithmetic.

$+$ for addition.

$-$ for subtraction.

$\times$ for multiplication.

$\div$ for division.

When two or more numbers joined by signs are enclosed by brackets ( ), the bracketed numbers must be reduced to one number before being joined in any other operation. Bracketed numbers placed adjacent to each other without a sign between them denotes muliplication. Thus, $(2 + 3)\ (12 - 8)$ means $(2 + 3) \times (12 - 8)$.

When the various signs occur in the same expression, the order of procedure is as follows:

First: Complete the calculations within the brackets.
Second: Complete the multiplication of numbers connected by "of".
Third: Complete all multiplication and division in order of occurrence.
Fourth: Complete all addition and subtraction in order of occurrence.

Example 1—$(16 - 4) \times 3 = 12 \times 3 = 36$

Example 2—$16 - 4 \times 3 = 16 - 12 = 4$

Example 3—$16 - 6 \div 3 = 16 - 2 = 14$

Simplify the following:

1. $3 + 4 \times 6 \div 3$	2. $(3 + 4) \times 6 \div 3$	3. $(3 + 4 \times 6) \div 3$	4. $15 - (10 + 5)$
5. $20 - 12 \div 2 + 4$	6. $(20 - 12) \div 2 + 4$	7. $20 - (12 \div 2 + 4)$	8. $18 - 2 \times 6 + 20 \div 5$
9. $(18 - 2) \times 6 + 20 \div 5$	10. $(6 + 4)\ (3 + 2)$	11. $(6 + 4) - (3 + 2)$	12. $(6 + 4) + (3 + 2)$
13. $(6 + 4 \times 3 + 2)$	14. $5\ (3 \times 4 - 2)$	15. $5\ (3 \times 4) - 2$	16. $5\ (3 \times 4) \div 2\ (10 + 5)$

PROBLEMS

Show solutions for the following problems. Be accurate and neat.

1. On September 1, a bank account showed a balance of $875.90. During the month of September, deposits amounting to $1575.75 were made, and cheques amounting to $1326.50 were issued. What was the balance on September 30?

2. How much would be realized from the sale of 10,000 pounds of potatoes at $1.50 per bag of 75 pounds?

3. A car travels 22 miles on one gallon of gasoline. How many gallons would be required for a trip of 4840 miles? What would be the cost at 42 cents a gallon?

4. Suppose 650 students paid admission of 5 cents each to see three films. If the rental cost of the films was $5.00 each, what was the net revenue from the show?

5. A factory employs 12,542 people. If the average wage is $68.75 a week, what is the amount of the average payroll?

6. If you were to divide $4200 equally among 10,500 people, how much would each receive?

7. A clerk earns $30 a week. If one half of the money is spent for room and board, how much does it cost him for room and board for one year?

8. A bookstore bought 150 textbooks at $1.52 each. If the books were sold for $1.90 each, how much profit was made?

9. A boy who earns 95 cents an hour worked 54 hours in one week. What were his total earnings for the week?

10. If a bottle of ginger ale costing 25 cents will serve 4 people, what will be the cost of serving 24 people?

11. A can of peas costs 14 cents. A case containing 24 cans can be bought for $2.88. How much is saved by buying a case?

12. An automobile can be purchased for $2500 by paying $1000 down and the balance in equal payments over 12 months. What would the monthly payment be?

Practice in Fundamental Operations

1. Add the following columns of figures both vertically and horizontally and prove by totals.

	(1)	(2)	(3)	(4)	(5)	(6)	Totals
1	24687	14792	98345	69482	19846	46275	
2	78916	29834	52617	82326	63451	79865	
3	88846	91348	87534	92764	83548	16749	
4	17937	71463	29213	35277	56382	82754	
5	57548	63275	43595	24215	17575	34256	
6	35685	42192	35787	92635	82348	64532	
7	69427	58756	79256	58591	45664	55688	
8	93254	87627	64878	47958	78993	98343	

2. Copy the following columns of figures in the spaces provided; then add your own figures both horizontally and vertically and check by totals. Figures must be neat and legible. Check your work carefully.

(1)	(2)	(3)	(4)	(5)	(6)
827.89	564.35	246.93	183.96	583.29	432.96
746.39	735.27	456.39	729.84	638.48	625.57
569.23	583.96	836.92	749.38	472.59	859.56
939.84	847.36	537.36	937.98	938.57	461.42
582.35	564.64	839.56	731.13	935.55	572.87
683.95	787.66	713.26	345.87	398.94	146.38
846.99	465.88	989.76	768.59	835.42	292.35
583.75	584.25	925.65	857.38	785.12	921.81

	(1)	(2)	(3)	(4)	(5)	(6)	Totals

UNIT 2

FACTORS

The Highest Common Factor

The product of 2 × 3 is 6. Therefore, the *factors* of 6 are 2 and 3. Similarly, 3 and 5 are the factors of 15.

Common Factors—A common factor is one which is used in making up two or more products.

Example—The factors of 6 are 2 and 3.
The factors of 15 are 3 and 5.
3 is a factor found in both products.
Therefore, 3 is a *common* factor of 6 and 15.

Prime Factors—A prime factor is one which cannot be further factorized; that is, it cannot be divided evenly by any other number.

Example 1—The factors of 6 are 2 and 3. The 2 and 3 cannot be further factorized; therefore, 2 and 3 are the prime factors of 6.

Example 2—The factors of 8 are 4 and 2, but the factor 4 may be further factorized as 2 × 2. Therefore, the prime factors of 8 are 2, 2 and 2.

Finding the Prime Factors of a Number—To find the prime factors of any number, reduce it to the smallest numbers which, when multiplied together, produce the number, and select those numbers which cannot be reduced further.

Find the prime factors of the following numbers.

1. 96	2. 120	3. 196
4. 256	5. 144	6. 348

Highest Common Factor—The highest common factor, usually abbreviated as H.C.F., is simply the greatest factor common to two or more products.

Example—The factors of 8 are 2, 2, and 2.
The factors of 28 are 2, 2, and 7.
The factors common to both are 2 and 2, 2 × 2 = 4.
Therefore, the H.C.F. of 8 and 28 is 4.

Finding the H.C.F. will be particularly useful in reducing fractions to their lowest terms.

Find the highest common factors of each of the following groups of numbers.

1. 84 and 126	2. 56, 84 and 140

3. 28, 36, 48

4. 42, 54, 72

5. 63, 105, 147

6. 140, 105, 280

7. 56, 84, 140

8. 42, 63, 84

9. 108, 270, 324

10. 36, 84, 132

11. 120, 72, 88

12. 85, 136, 187

THE HIGHEST COMMON FACTOR

For small numbers, the H.C.F. may be found conveniently by the "prime factors" method as already shown, or merely by inspection. For larger numbers, the following method may be used.

First— Divide the smaller number into the greater.

Second—Divide the remainder from the first step into the smaller number, then divide the remainder from this division into the last divisor and continue until there is no remainder. The last divisor is the H.C.F.

EXAMPLE—Find the H.C.F. of 792 and 968.

```
           1
 792 ) 968
       792       4
       176 ) 792
             704      2
              88 ) 176
                   176
                   ===
```

As 88 is the last divisor, 88 is the H.C.F.

Using this method, find the H.C.F. of each of the following groups of numbers.

1. 210 and 462	2. 462 and 399	3. 256 and 352
4. 480 and 570	5. 535 and 1177	6. 313 and 513
7. 828 and 1012	8. 462 and 714	9. 715 and 1001

THE LOWEST COMMON MULTIPLE

A multiple is the product obtained by multiplying one number by another number. For example, 45 is a multiple of 9 since 9 × 5 equals 45.

A *Common Multiple* is one which is a multiple of two or more numbers. For example, 45 is a multiple of 9, but it is also a multiple of 15 since 15 × 3 equals 45.

The *Lowest Common Multiple* (L.C.M.) of two or more numbers is the lowest number that is a multiple of each of them. For example, 90 is a common multiple of 9 and 15, but 45 is the common multiple which is lowest for both 9 and 15.

The L.C.M. of numbers may be found by inspection and mental calculation, or by dividing by prime factors.

EXAMPLE—Find the L.C.M. of 18, 24 and 28.

$$\begin{array}{r|rrr} 2 & 18, & 24, & 28 \\ \hline 2 & 9, & 12, & 14 \\ \hline 3 & 9, & 6, & 7 \\ \hline & 3, & 2, & 7 \end{array}$$

The L.C.M. = 2 × 2 × 3 × 3 × 2 × 7
= 504

PROCEDURE:

1. Use only prime factors for division.
2. Any prime factor may be used provided it is a factor of at least two numbers.
3. When the prime factor used is not a factor of a number, merely bring down that number.
4. When no more prime factors can be employed, find the product of the factors used and the remainders.

The L.C.M. will be required in the addition and subtraction of fractions.

1. By inspection find the L.C.M. of the following groups of numbers.

(1) 2, 4, 6 =	(2) 5, 15, 60 =	(3) 5, 7, 10 =	(4) 2, 3, 4 =
(5) 3, 5, 10 =	(6) 6, 18, 54 =	(7) 6, 8, 9 =	(8) 3, 4, 5 =
(9) 4, 6, 8 =	(10) 2, 3, 5 =	(11) 4, 5, 15 =	(12) 4, 5, 6 =
(13) 5, 6, 15 =	(14) 3, 5, 7 =	(15) 7, 12, 21 =	(16) 12, 72, 144 =
(17) 8, 12, 16 =	(18) 5, 15, 25 =	(19) 5, 9, 15 =	(20) 25, 50, 75 =
(21) 3, 5, 9 =	(22) 15, 20, 30 =	(23) 3, 4, 16 =	(24) 8, 10, 12 =

2. By using prime factors, find the L.C.M. of each of the following groups of numbers.

(1) 24, 36, 42	(2) 46, 30, 115	(3) 36, 56, 96	(4) 72, 42, 32

(5) 15, 18, 24, 64

(6) 16, 18, 25, 35

(7) 8, 12, 15, 20

(8) 8, 12, 20, 24

(9) 6, 12, 18, 20

(10) 12, 18, 36, 45

(11) 20, 30, 40, 50

(12) 8, 10, 12, 16

(13) 45, 21, 35, 56

(14) 15, 18, 21, 42

(15) 9, 15, 21, 27

(16) 12, 16, 20, 24

1. Add:

$234.45	$626.48	$509.64	$309.91
467.22	367.21	619.27	562.26
369.81	545.50	408.16	679.99
722.46	307.72	339.91	373.21
368.19	639.98	516.69	647.77
541.07	568.71	329.92	355.65
629.56	424.18	926.62	625.54
407.17	607.75	224.90	327.71
516.62	321.46	375.75	582.82
773.24	466.67	688.81	609.09

2. Subtract:

5678945	35467896	348798162	96896743
2335678	19967896	235615573	78970634

3. Multiply:

3456432	5678439	8989987	7893455
9	11	8	12

4. Divide:

9)987975	7)874531	11)675631	8)789872

5. Fill in and total each invoice.

65 lbs. @ $ .11		34 yds. @ $ .19	
23 " " .09		51 " " .11	
54 " " .10		9 " " .33	
67 " " .07		8 " " .99	
35 " " .12		4 " " .37	
Total		Total	

UNIT 3

FRACTIONS

Nature of Fractions

A fraction of something is merely a part of it. For example, one inch is one-twelfth ($\frac{1}{12}$) of your 12-inch ruler; 2 inches is $\frac{2}{12}$; 3 inches is $\frac{3}{12}$; etc. The 12 inches represents $\frac{12}{12}$ or 1, the whole ruler.

The number above the dividing line of the fraction is known as the *numerator*; the number below is called the *denominator.* In the fraction $\frac{11}{12}$, 11 is the numerator, and 12 is the denominator.

Fractions may be *proper* or *improper.* A proper fraction is one in which the numerator is less than the denominator; for example, $\frac{1}{2}$ and $\frac{3}{4}$. An improper fraction is one in which the numerator is greater than the denominator; for example, $\frac{5}{4}$ and $\frac{11}{5}$.

A mixed number may be expressed as an improper fraction. For example, $3\frac{1}{2}$ equals 3 whole units and one half of a unit. The 3 whole units can be expressed as 6 half units. Add to these the one half unit, and we have 7 half units, which can be expressed as $\frac{7}{2}$. The procedure can be simplified as follows: Multiply the whole number by the denominator (3×2), and add the numerator. The sum is 7. Write the result over the denominator, and the result is $\frac{7}{2}$. By the same rule, $5\frac{1}{3} = \frac{16}{3}$.

To express an improper fraction as a mixed number, simply divide the numerator by the denominator. In this way you get a whole number and a remainder, which when placed over the denominator is the fractional part of the mixed number. Thus, $\frac{7}{2} = 3\frac{1}{2}$, and $\frac{16}{3} = 5\frac{1}{3}$.

1. Express the following mixed numbers as improper fractions.

(1) $4\frac{9}{10}$	(2) $8\frac{7}{12}$	(3) $9\frac{3}{5}$	(4) $12\frac{9}{10}$	(5) $15\frac{7}{8}$	(6) $11\frac{11}{12}$
(7) $4\frac{9}{16}$	(8) $8\frac{3}{16}$	(9) $14\frac{7}{8}$	(10) $19\frac{3}{4}$	(11) $2\frac{13}{16}$	(12) $13\frac{5}{6}$
(13) $8\frac{3}{5}$	(14) $11\frac{7}{9}$	(15) $15\frac{4}{5}$	(16) $21\frac{3}{7}$	(17) $3\frac{2}{11}$	(18) $17\frac{8}{9}$

2. Express the following improper fractions as mixed numbers.

(1) $\frac{131}{8}$	(2) $\frac{89}{6}$	(3) $\frac{79}{12}$	(4) $\frac{261}{10}$	(5) $\frac{129}{5}$	(6) $\frac{261}{16}$
(7) $\frac{55}{8}$	(8) $\frac{119}{12}$	(9) $\frac{62}{7}$	(10) $\frac{113}{3}$	(11) $\frac{151}{16}$	(12) $\frac{343}{10}$
(13) $\frac{61}{8}$	(14) $\frac{207}{20}$	(15) $\frac{37}{12}$	(16) $\frac{103}{9}$	(17) $\frac{323}{25}$	(18) $\frac{87}{24}$

EQUIVALENT FRACTIONS

Fractions with small denominators are more readily pictured than fractions with large denominators. For example, to express 6 inches as a fraction of a 12-inch ruler, one would say one-half ($\frac{1}{2}$) rather than 6/12.

It is common practice, therefore, to express fractions in their lowest terms. To do this, simply divide the numerator and the denominator by their highest common factor.

EXAMPLE—Reduce $\frac{8}{12}$ to its lowest terms.

The H.C.F. of 8 and 12 is readily determined as 4.

Then $\frac{8 \div 4}{12 \div 4} = \frac{2}{3}$

Hence $\frac{8}{12}$ is equivalent to $\frac{2}{3}$.

If the highest common factor cannot be determined readily by inspection, the H.C.F. may be found by the methods shown on pages 25 and 27. Another method is to keep dividing by common factors until further reduction is impossible.

EXAMPLE—Reduce $\frac{8}{12}$ to its lowest terms.

$$\frac{8 \div 2}{12 \div 2} = \frac{4}{6} = \frac{4 \div 2}{6 \div 2} = \frac{2}{3}$$

1. Reduce the following fractions to their lowest terms.

(1) $\frac{45}{75}$	(2) $\frac{28}{98}$	(3) $\frac{18}{108}$	(4) $\frac{36}{124}$
(5) $\frac{125}{375}$	(6) $\frac{184}{256}$	(7) $\frac{73}{365}$	(8) $\frac{146}{365}$

A fraction may also be expressed as an equivalent fraction having a higher denominator. To do this, simply multiply the numerator and the denominator by the required common factor.

EXAMPLE—Express $\frac{2}{3}$ in twelfths.

To raise 3 to 12, it is necessary to multiply the 3 by the factor 4. Multiply the numerator also by 4

$$\frac{2 \times 4}{3 \times 4} = \frac{8}{12}$$

2. Express the following fractions with higher denominators as indicated.

(1) $\frac{2}{3} = \frac{\quad}{24}$	(2) $\frac{5}{16} = \frac{\quad}{48}$	(3) $\frac{11}{12} = \frac{\quad}{60}$	(4) $\frac{7}{8} = \frac{\quad}{32}$
(5) $\frac{4}{25} = \frac{\quad}{75}$	(6) $\frac{5}{9} = \frac{\quad}{36}$	(7) $\frac{7}{18} = \frac{\quad}{54}$	(8) $\frac{5}{6} = \frac{\quad}{48}$

Comparison of Fractions

When two fractions have different denominators, it may be necessary to express them as fractions with the same denominator in order to show which fraction is the greater.

Example—Which is the greater fraction, $\frac{3}{5}$ or $\frac{2}{3}$?

1. The L.C.M. of the denominators 5 and 3 is 15.
2. Using 15 as the common denominator,
   $\frac{3}{5} = \frac{9}{15}$, and $\frac{2}{3} = \frac{10}{15}$.
   Therefore, $\frac{2}{3}$ is the greater fraction.

1. Express each pair of fractions with a common denominator, to show which is the greater.

(1) $\frac{7}{12}$ or $\frac{9}{16}$	(2) $\frac{3}{10}$ or $\frac{4}{15}$	(3) $\frac{5}{9}$ or $\frac{8}{15}$	(4) $\frac{9}{16}$ or $\frac{13}{24}$
(5) $\frac{11}{15}$ or $\frac{4}{5}$	(6) $\frac{9}{14}$ or $\frac{11}{21}$	(7) $\frac{17}{32}$ or $\frac{25}{48}$	(8) $\frac{19}{36}$ or $\frac{17}{32}$

2. Express each group of fractions with the same denominator. Encircle the largest fraction.

(1) $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}$	(2) $\frac{5}{6}, \frac{7}{9}, \frac{11}{15}, \frac{3}{4}$	(3) $\frac{7}{12}, \frac{11}{20}, \frac{5}{8}, \frac{29}{60}$
(4) $\frac{11}{24}, \frac{13}{30}, \frac{7}{16}, \frac{5}{12}$	(5) $\frac{27}{36}, \frac{7}{9}, \frac{19}{24}, \frac{5}{8}$	(6) $\frac{7}{12}, \frac{31}{60}, \frac{13}{20}, \frac{11}{15}$
(7) $\frac{8}{15}, \frac{13}{25}, \frac{37}{75}, \frac{22}{45}$	(8) $\frac{17}{30}, \frac{31}{50}, \frac{11}{15}, \frac{7}{10}$	(9) $\frac{13}{21}, \frac{17}{28}, \frac{29}{28}, \frac{9}{14}$

ADDITION OF FRACTIONS

In order to add fractions, they must first be expressed with a common denominator.

EXAMPLE—Add $\frac{2}{3} + \frac{3}{4} + \frac{5}{6}$

The common denominator is the L.C.M. of 3, 4 and 6, which is 12.
The addition may be done either vertically or horizontally.

VERTICAL METHOD

$$\begin{array}{r}
\frac{2}{3} = \frac{8}{12} \\[4pt]
\frac{3}{4} = \frac{9}{12} \\[4pt]
\frac{5}{6} = \frac{10}{12} \\
\hline
\frac{27}{12}
\end{array}$$

HORIZONTAL METHOD

$$\frac{2}{3} + \frac{3}{4} + \frac{5}{6} = \frac{8 + 9 + 10}{12} = \frac{27}{12}$$

The sum $\frac{27}{12}$ expressed as a mixed number is $2\frac{3}{12}$.

Reduced to its lowest terms, $2\frac{3}{12} = 2\frac{1}{4}$

Addition of mixed numbers is performed by adding the whole numbers and the fractions separately, and then adding the results.

EXAMPLE—Add $2\frac{2}{3} + 3\frac{3}{4} + 4\frac{5}{6}$

(1) The whole numbers are added: $2 + 3 + 4 = 9$

(2) The fractions are added: $\frac{2}{3} + \frac{3}{4} + \frac{5}{6} = \frac{27}{12} = 2\frac{3}{12} = 2\frac{1}{4}$

(3) Both results are added: $9 + 2\frac{1}{4} = 11\frac{1}{4}$

The same procedure is used for adding mixed numbers either vertically or horizontally.

Complete the following additions vertically.

1.	2.	3.	4.
$\frac{3}{4}$	$\frac{9}{16}$	$6\frac{2}{3}$	$32\frac{15}{32}$
$\frac{5}{6}$	$\frac{7}{12}$	$3\frac{1}{8}$	$17\frac{3}{16}$
$\frac{7}{8}$	$\frac{5}{8}$	$5\frac{1}{2}$	$25\frac{5}{8}$
$\frac{5}{9}$	$\frac{11}{32}$	$8\frac{3}{4}$	$14\frac{61}{64}$
$\frac{7}{12}$	$\frac{11}{48}$	$12\frac{5}{6}$	$20\frac{3}{8}$

ADDITION OF FRACTIONS

Complete the following additions horizontally.

1. $\frac{1}{2} + \frac{3}{5} + \frac{2}{3} + \frac{3}{4}$

2. $\frac{2}{3} + \frac{7}{18} + \frac{11}{36} + \frac{7}{12}$

3. $\frac{17}{25} + \frac{11}{50} + \frac{14}{15} + \frac{56}{75}$

4. $15\frac{5}{8} + 18\frac{3}{4} + 5\frac{11}{16} + 16\frac{1}{2}$

5. $75\frac{2}{5} + \frac{5}{9} + 18\frac{2}{15} + \frac{26}{45}$

6. $14\frac{1}{10} + 16\frac{5}{12} + \frac{19}{20} + 2\frac{17}{24}$

7. $37\frac{2}{9} + 15 + 14\frac{2}{7} + 16\frac{4}{21}$

8. $8\frac{3}{4} + 19\frac{7}{32} + \frac{9}{64} + 37$

9. $14\frac{1}{2} + 16\frac{1}{5} + 9\frac{11}{15} + 10\frac{1}{3}$

10. $4\frac{6}{25} + \frac{124}{125} + 17\frac{1}{5} + \frac{19}{25}$

11. $8\frac{11}{16} + \frac{47}{48} + 1\frac{7}{12} + 9\frac{26}{32}$

12. $25\frac{1}{4} + 16\frac{1}{3} + 2\frac{1}{5} + 18\frac{1}{6}$

SUBTRACTION OF FRACTIONS

To subtract one fraction from another, first express the fractions with common denominators and then subtract.

EXAMPLE 1: $\frac{2}{3} - \frac{5}{8}$

$$\begin{array}{rcr} \frac{2}{3} & = & \frac{16}{24} \\ \frac{5}{8} & = & \frac{15}{24} \\ \hline & & \frac{1}{24} \end{array}$$

EXAMPLE 2: $15\frac{2}{3} - 12\frac{5}{8}$

$$\begin{array}{rcr} 15\frac{2}{3} & = & 15\frac{16}{24} \\ 12\frac{5}{8} & = & 12\frac{15}{24} \\ \hline & & 3\frac{1}{24} \end{array}$$

EXAMPLE 3: $10\frac{1}{4} - 6\frac{1}{3}$

$$\begin{array}{rcrcr} 10\frac{1}{4} & = & 10\frac{3}{12} & = & 9\frac{15}{12} \\ 6\frac{1}{3} & = & 6\frac{4}{12} & = & 6\frac{4}{12} \\ \hline & & & & 3\frac{11}{12} \end{array}$$

Observe in Example 3 that $\frac{4}{12}$ is more than $\frac{3}{12}$. Therefore, it is necessary to borrow 1, or $\frac{12}{12}$ from the 10. The $10\frac{3}{12}$ now becomes $9\frac{15}{12}$ and the subtraction may be completed.

Complete the following subtractions.

1. $\begin{array}{r} \frac{3}{4} \\ -\frac{2}{3} \\ \hline \end{array}$	2. $\begin{array}{r} \frac{7}{16} \\ -\frac{1}{32} \\ \hline \end{array}$	3. $\begin{array}{r} \frac{18}{25} \\ -\frac{7}{15} \\ \hline \end{array}$	4. $\begin{array}{r} \frac{11}{24} \\ -\frac{5}{18} \\ \hline \end{array}$
5. $\begin{array}{r} 15\frac{3}{5} \\ -\ 2\frac{1}{2} \\ \hline \end{array}$	6. $\begin{array}{r} 9\frac{3}{4} \\ -\ 1\frac{1}{3} \\ \hline \end{array}$	7. $\begin{array}{r} 12\frac{2}{3} \\ -\ 9\frac{5}{6} \\ \hline \end{array}$	8. $\begin{array}{r} 4\frac{1}{4} \\ -\ 3\frac{3}{4} \\ \hline \end{array}$
9. $\begin{array}{r} 17 \\ -\ 4\frac{3}{8} \\ \hline \end{array}$	10. $\begin{array}{r} 27 \\ -\ 18\frac{1}{6} \\ \hline \end{array}$	11. $\begin{array}{r} 14 \\ -\ 6\frac{3}{4} \\ \hline \end{array}$	12. $\begin{array}{r} 10 \\ -\ 9\frac{4}{5} \\ \hline \end{array}$
13. $\begin{array}{r} 9\frac{3}{5} \\ -\ 7\frac{1}{2} \\ \hline \end{array}$	14. $\begin{array}{r} 12\frac{1}{8} \\ -\ 11\frac{7}{12} \\ \hline \end{array}$	15. $\begin{array}{r} 14\frac{2}{3} \\ -\ 8\frac{7}{8} \\ \hline \end{array}$	16. $\begin{array}{r} 35\frac{4}{9} \\ -\ 18\frac{1}{6} \\ \hline \end{array}$
17. $\begin{array}{r} 65\frac{1}{10} \\ -\ 24\frac{7}{8} \\ \hline \end{array}$	18. $\begin{array}{r} 35\frac{3}{5} \\ -\ 19\frac{17}{30} \\ \hline \end{array}$	19. $\begin{array}{r} 1\frac{7}{10} \\ -\ \frac{8}{15} \\ \hline \end{array}$	20. $\begin{array}{r} 1\frac{1}{9} \\ -\ \frac{5}{6} \\ \hline \end{array}$

MULTIPLICATION OF FRACTIONS

To multiply proper fractions:

1. Multiply the numerators together.
2. Multiply the denominators together.
3. Reduce the resulting fraction to its lowest terms.

EXAMPLE 1— $\frac{2}{3} \times \frac{4}{5} = \frac{8}{15}$

When it will reduce the amount of work, use cancellation by common factors as shown in Example 2.

EXAMPLE 2— $\frac{\overset{2}{\cancel{10}}}{\underset{9}{\cancel{27}}} \times \frac{\overset{1}{\cancel{3}}}{\underset{1}{\cancel{5}}} = \frac{2 \times 1}{9 \times 1} = \frac{2}{9}$

Note, however, that the above example could have been done as follows:

$$\frac{10}{27} \times \frac{3}{5} = \frac{30}{135} = \frac{2}{9}$$

The same procedure is followed when there are more than two fractions to be multiplied together.

Multiply the following fractions.

1. $\frac{5}{8} \times \frac{16}{25}$	2. $\frac{5}{6} \times \frac{3}{4}$	3. $\frac{9}{40} \times \frac{35}{36}$	4. $\frac{27}{50} \times \frac{15}{36}$
5. $\frac{1}{3} \times \frac{2}{5} \times \frac{7}{9}$	6. $\frac{18}{25} \times \frac{5}{12} \times \frac{3}{10}$	7. $\frac{7}{12} \times \frac{24}{25} \times \frac{15}{16}$	8. $\frac{2}{3} \times \frac{4}{5} \times \frac{15}{16}$

To multiply mixed numbers:

1. Convert the mixed numbers to improper fractions.
2. Multiply the improper fractions as illustrated in the example for proper fractions, and express the result as a mixed number, with the fraction reduced to its lowest terms.

EXAMPLE— $3\frac{1}{3} \times 2\frac{1}{4} = \frac{\overset{5}{\cancel{10}}}{\underset{1}{\cancel{3}}} \times \frac{\overset{3}{\cancel{9}}}{\underset{2}{\cancel{4}}} = \frac{15}{2} = 7\frac{1}{2}$

Multiply the following mixed numbers.

1. $7\frac{1}{2} \times 4\frac{1}{5}$	2. $8\frac{3}{4} \times 4\frac{4}{5}$	3. $6\frac{2}{3} \times 2\frac{1}{6}$	4. $6\frac{7}{8} \times 10\frac{2}{3}$
5. $7\frac{1}{2} \times 6\frac{3}{4} \times \frac{1}{5}$	6. $4\frac{1}{8} \times 5\frac{2}{3} \times \frac{2}{11}$	7. $10\frac{1}{2} \times 8\frac{1}{3} \times 1\frac{1}{5}$	8. $6\frac{1}{8} \times 4\frac{2}{7} \times 2\frac{1}{5}$

MULTIPLICATION OF FRACTIONS

To multiply a whole number by a fraction:

1. Multiply the whole number by the numerator of the fraction.
2. Divide this product by the denominator of the fraction.

EXAMPLE 1—$15 \times \frac{1}{3} = \frac{15}{3} = 5$ EXAMPLE 2—$15 \times \frac{3}{4} = \frac{45}{4} = 11\frac{1}{4}$

Multiply the following whole numbers and fractions.

1. $18 \times \frac{2}{3}$	2. $18 \times \frac{3}{4}$	3. $25 \times \frac{1}{3}$	4. $25 \times \frac{2}{3}$
5. $22 \times \frac{1}{4}$	6. $22 \times \frac{3}{4}$	7. $45 \times \frac{2}{5}$	8. $45 \times \frac{3}{4}$

To multiply a whole number by a mixed number:

1. Multiply the whole number by the fraction.
2. Multiply the whole number by the whole number.
3. Add the two products.

EXAMPLE 1—$225 \times 2\frac{1}{5}$

$$\begin{array}{rl} 225 & \\ 2\frac{1}{5} & \\ \hline 45 & (\frac{1}{5} \times 225) \\ 450 & (2 \times 225) \\ \hline 495 & \end{array}$$

EXAMPLE 2—$225 \times 2\frac{1}{2}$

$$\begin{array}{rl} 225 & \\ 2\frac{1}{2} & \\ \hline 112\frac{1}{2} & (\frac{1}{2} \times 225) \\ 450 & (2 \times 225) \\ \hline 562\frac{1}{2} & \end{array}$$

You may also complete this multiplication by turning the mixed number to an improper fraction, and multiplying.

EXAMPLE 3—$225 \times 2\frac{1}{5} = 225 \times \frac{11}{5} = \frac{2475}{5} = 495$

The choice of method should depend upon which one is the quicker.

Multiply the following numbers, using the method illustrated in Examples 1 and 2.

1. $\begin{array}{r} 265 \\ 6\frac{1}{5} \\ \hline \end{array}$	2. $\begin{array}{r} 1125 \\ 6\frac{2}{5} \\ \hline \end{array}$	3. $\begin{array}{r} 365 \\ 16\frac{1}{5} \\ \hline \end{array}$	4. $\begin{array}{r} 365 \\ 16\frac{3}{5} \\ \hline \end{array}$
5. $\begin{array}{r} 364 \\ 8\frac{1}{4} \\ \hline \end{array}$	6. $\begin{array}{r} 4064 \\ 17\frac{3}{8} \\ \hline \end{array}$	7. $\begin{array}{r} 3636 \\ 12\frac{2}{3} \\ \hline \end{array}$	8. $\begin{array}{r} 918 \\ 22\frac{1}{6} \\ \hline \end{array}$

To divide one fraction by another:

1. If mixed numbers are involved, change to improper fractions.
2. Change the division sign to multiplication and invert the divisor.
3. Proceed as with multiplication.

Be careful to invert the *divisor*, not the number into which it is being divided. Observe the difference in the examples below.

EXAMPLE 1—$\frac{5}{8} \div \frac{3}{4} = \frac{5}{\underset{2}{\cancel{8}}} \times \frac{\cancel{4}}{3} = \frac{5}{6}$

EXAMPLE 2—Divide $\frac{5}{8}$ into $\frac{3}{4}$

Here we have $\frac{3}{4} \div \frac{5}{8} = \frac{3}{\cancel{4}} \times \frac{\overset{2}{\cancel{8}}}{5} = \frac{6}{5} = 1\frac{1}{5}$

EXAMPLE 3—$3\frac{1}{5} \div 2\frac{2}{5} = \frac{16}{5} \div \frac{12}{5} = \frac{\overset{4}{\cancel{16}}}{\cancel{5}} \times \frac{\cancel{5}}{\underset{3}{\cancel{12}}} = \frac{4}{3} = 1\frac{1}{3}$

EXAMPLE 4—$3\frac{1}{5} \div 4 = \frac{16}{5} \div \frac{4}{1} = \frac{\overset{4}{\cancel{16}}}{5} \times \frac{1}{\cancel{4}} = \frac{4}{5}$

Divide the following fractions as indicated.

1. $\frac{5}{8} \div \frac{3}{8}$	2. $\frac{4}{5} \div \frac{1}{3}$	3. $\frac{3}{5} \div 3$	4. $\frac{5}{8} \div 8$
5. $6\frac{3}{4} \div 5\frac{5}{8}$	6. $\frac{3}{8} \div 6\frac{3}{4}$	7. $5\frac{1}{4} \div 7$	8. $12\frac{1}{2} \div 5$
9. $35 \div 7\frac{1}{2}$	10. $96 \div 4\frac{1}{2}$	11. $3\frac{2}{3} \div 16\frac{1}{2}$	12. $37\frac{4}{5} \div 42\frac{3}{5}$

MIXED OPERATIONS WITH FRACTIONS

When several fractions are joined by different signs, the order of operations is as follows:

1. Bracketed operations, first.
2. Quantities joined by "of", second ("of" is treated as a multiplication sign).
3. Multiplication and division in order of occurrence.
4. Addition and subtraction in order of occurrence.

EXAMPLE—Simplify $\frac{1}{5} \text{ of } \frac{5}{8} + \left(\frac{1}{3} - \frac{1}{6}\right) \div \frac{1}{6} \times \frac{3}{2}$

Step One: $= \frac{1}{5} \text{ of } \frac{5}{8} + \frac{1}{6} \div \frac{1}{6} \times \frac{3}{2}$ (Bracketed expression reduced.)

Step Two: $= \frac{1}{8} + \frac{1}{6} \div \frac{1}{6} \times \frac{3}{2}$ ("Of" signs dealt with.)

Step Three: $= \frac{1}{8} + \frac{1}{\cancel{6}} \times \frac{\cancel{6}}{1} \times \frac{3}{2}$ (Multiplication and Division completed.)

Step Four: $= \frac{1}{8} + \frac{3}{2} = \frac{1}{8} + \frac{12}{8}$

$= \frac{13}{8} = 1\frac{5}{8}$ (Addition and Subtraction completed.)

Simplify the following numerical expressions.

1. $\frac{5}{8} \text{ of } \frac{12}{25}$
2. $\frac{1}{4} \text{ of } 25$
3. $\frac{1}{3} \text{ of } 4\frac{1}{8}$
4. $6\frac{2}{5} \text{ of } 4\frac{3}{8}$
5. $\frac{3}{8} + \frac{1}{6} - \frac{1}{4}$
6. $\frac{5}{9} \times \frac{3}{4} - \frac{1}{12}$
7. $2\frac{1}{2} - \frac{3}{4} \div 2$
8. $\frac{7}{8} \text{ of } 4\frac{1}{2} \div \frac{7}{16}$
9. $\left(\frac{1}{2} - \frac{1}{3}\right) \div \left(\frac{1}{2} - \frac{1}{3}\right)$
10. $\frac{4}{5} \text{ of } \frac{7}{8} + 5\frac{1}{2}$
11. $\frac{1}{2} \text{ of } 10 \div (7 + 8)$
12. $9 \div \frac{2}{3} + 6\frac{1}{4}$
13. $1\frac{4}{5} \div 6 + 3\frac{1}{3}$

COMPLEX FRACTIONS

When one fraction or a group of fractions is placed over another fraction or group of fractions, division is implied. Note that the numerator and the denominator of the complex fraction must be simplified before the final division is made.

EXAMPLE 1— $\dfrac{5\frac{2}{5}}{2\frac{1}{4}} = 5\frac{2}{5} \div 2\frac{1}{4} = \frac{27}{5} \div \frac{9}{4} = \frac{\overset{3}{\cancel{27}}}{5} \times \frac{4}{\cancel{9}} = \frac{12}{5} = 2\frac{2}{5}$

EXAMPLE 2— $\dfrac{\frac{1}{2}+\frac{1}{3}}{\frac{1}{2}-\frac{1}{3}} = \dfrac{\frac{3}{6}+\frac{2}{6}}{\frac{3}{6}-\frac{2}{6}} = \dfrac{\frac{5}{6}}{\frac{1}{6}} = \frac{5}{\cancel{6}} \times \frac{\cancel{6}}{1} = 5$

Simplify the following complex fractions.

1. $\dfrac{18\frac{3}{4}}{3\frac{3}{8}}$

2. $\dfrac{\frac{1}{5} \div \frac{1}{5}}{\frac{1}{2} \text{ of } 7}$

3. $\dfrac{\frac{1}{2} + \frac{3}{4} \div \frac{1}{4}}{\frac{1}{2} \times \frac{3}{4} - \frac{1}{4}}$

4. $\dfrac{\frac{1}{8} + \frac{2}{3}}{\frac{1}{2} \text{ of } \frac{3}{4}}$

5. $\dfrac{42}{1 + 1 \times \frac{1}{20}}$

6. $5\frac{3}{4} + \dfrac{2\frac{1}{2}}{4}$

7. $\dfrac{\frac{2}{3}}{\frac{3}{4}} \times \dfrac{\frac{3}{4}}{\frac{2}{3}}$

8. $\dfrac{1}{10\frac{1}{2}} + 4\frac{1}{7}$

9. $\dfrac{1 - \frac{5}{6}}{\frac{1}{6}}$

1. The length of a pattern is made up of $8\frac{1}{2}$ inches, $5\frac{1}{4}$ inches, and $6\frac{3}{4}$ inches. What is the total length?

2. Find the total cost of the following pieces of cloth at $\$2\frac{1}{2}$ a yard: $13\frac{3}{4}$ yds., $12\frac{1}{2}$ yds., and $10\frac{1}{4}$ yds.

3. Find the profit on $150\frac{3}{4}$ tons of coal bought at $16 a ton and sold at $26 a ton.

4. A roast of beef weighing 3 pounds (16 ounces = one pound) was divided among 5 people. How many ounces did each receive?

5. A merchant sold goods which cost $250 for $1\frac{2}{5}$ times his cost. What was his profit?

6. Goods which cost $135 were sold at a profit of 2/5 of the cost. What was the selling price?

7. A student was paid 75 cents an hour for after-school work. If he worked $1\frac{1}{2}$, 2, $1\frac{3}{4}$, $1\frac{1}{4}$, $2\frac{1}{2}$ and $3\frac{1}{4}$ hours from Monday to Saturday, what did he earn?

8. A baby-sitter earns 30¢ an hour. If she "sits" from 8 p.m. to 11:30 p.m., what does she earn?

9. A man divided his property among his four sons as follows: ⅓ to the first, ¼ to the second, and ⅕ to the third. What fraction of the property did the fourth receive?

10. A farmer sold ⅔ of his crop to A, ½ of the remainder to B, and the rest equally to C and D. What fraction of the crop was sold to D?

11. A person earning $320 a month spent ¼ of it for rent, ½ of it for food and household items, and ¼ of the balance for miscellaneous purposes, and the rest was saved. How much was saved?

12. A total of $14 was divided between two persons, one getting 2½ times as much as the other. How much did each receive?

13. Two oil tanks contain a total of 675 gallons. One tank is 3½ times as large as the other. How many gallons does each contain?

14. Divide $76 among three persons, giving the second 1½ times as much as the first, and the third 1½ times as much as the second.

1. Add the following numbers. Check your work carefully for accuracy.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
249½	174¾	967¼	462¾	947½	746¼	583¾	629½
574¾	738½	846½	286¾	583¼	825½	836¼	947¾
846½	498¾	946¼	378¼	682¾	489¾	476½	837¼
746¾	846¼	423¾	486½	693¼	584½	648¾	284½
453½	647½	537½	837¾	273¼	959¾	946½	476¾
584¼	496¾	385¾	756½	475½	586½	385¾	157½
857½	795¾	149½	628¾	163¼	714¼	529¼	387¾
746¾	836½	284¾	937¼	849½	426¾	837¾	246½

(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
354½	936¼	147¾	582½	684¼	749¾	839¼	475½
846¾	489½	968½	462¼	574½	438½	658½	437¾
463¼	758¾	364¾	649½	732¾	746¼	463¾	639¼
756½	354½	476¼	639¼	284¼	438¼	736¼	354½
279¼	936¾	647¼	535½	463¾	867½	949¾	576¾
147½	659½	376½	648¾	352½	485¾	365½	465½
857¾	647¼	364¾	547¼	648¾	547¼	476¼	479¼
574½	654¼	548¼	486¾	675½	642¼	537½	342½

2. Subtract:

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
694¼	947¾	830¼	804½	751¼	901½	813¼	740¾
209½	108½	417¾	567¾	308½	315¼	409½	589¼

(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
831½	740¾	731¼	601¼	910½	731¼	702½	841¼
163¾	484½	194½	392¾	117¾	432½	102¾	541¾

(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
984½	621¼	601¾	679½	371¾	497¼	462½	560½
136¾	522¾	429½	428¼	209½	339¼	237¼	409¼

UNIT 4

DECIMAL FRACTIONS

Decimal fractions are common fractions having as denominators 10 or some power of 10. Since the denominator is understood, a decimal fraction is written without a denominator; a decimal point precedes it.

Example— $\frac{1}{10} = .1$; $\frac{1}{100} = .01$; $\frac{1}{1000} = .001$, etc.

It will be observed that the number of zeros in the denominator is the same as the number of figures following the decimal point.

Mixed numbers are expressed as follows:

$1\frac{1}{10} = 1.1$; $1\frac{1}{100} = 1.01$; $1\frac{1}{1000} = 1.001$, etc.

It follows, therefore, that 1.0, 1.00, and 1.000 are all equal to 1; zeros alone after the decimal point make no change in the value. Thus, we often express $1 as $1.00.

Express the following decimal fractions as common fractions in their lowest terms.

1. .5	2. .25	3. .225	4. .250
5. .125	6. .675	7. .375	8. .875
9. .05	10. .025	11. .008	12. .0375
13. 3.75	14. 5.025	15. 10.0125	16. 16.005
17. 8.8	18. 12.14	19. 25.25	20. 40.24
21. 175.175	22. 1.020	23. 7.70	24. 17.340

DECIMAL FRACTIONS

A common fraction may also be expressed as a decimal fraction. To do this, the numerator of the fraction is divided by the denominator. It is important that the decimal point be placed correctly. Observe that in the following examples the decimal point in the quotient is placed directly over the decimal point in the dividend.

EXAMPLE 1—Express $\frac{4}{5}$ as a decimal fraction:

$$\frac{4}{5} = 5\overset{.8}{\overline{)4.0}} = .8$$

Proof: Express .8 as a fraction: $.8 = \frac{8}{10} = \frac{4}{5}$

EXAMPLE 2—Express $\frac{3}{4}$ as a decimal fraction:

$$\frac{3}{4} = 4\overset{.75}{\overline{)3.00}} = .75$$

Proof: Express .75 as a fraction: $.75 = \frac{75}{100} = \frac{3}{4}$

If a mixed number is involved, the fraction is expressed as a decimal preceded by the whole number.

EXAMPLE 3—Express $3\frac{1}{4}$ as a decimal fraction.

$$\frac{1}{4} = 4\underset{.25}{\underline{|1.00}} = .25$$

Therefore $3\frac{1}{4} = 3.25$

Express the following fractions as decimals.

1. $\frac{2}{5}$	2. $\frac{3}{8}$	3. $\frac{5}{8}$	4. $\frac{11}{20}$
5. $\frac{1}{8}$	6. $\frac{1}{40}$	7. $\frac{1}{50}$	8. $\frac{1}{25}$
9. $8\frac{1}{4}$	10. $9\frac{3}{8}$	11. $10\frac{2}{25}$	12. $12\frac{1}{8}$
13. $30\frac{7}{8}$	14. $15\frac{1}{2}$	15. $20\frac{1}{20}$	16. $16\frac{3}{20}$
17. $247\frac{3}{5}$	18. $15\frac{5}{8}$	19. $10\frac{1}{200}$	20. $9\frac{11}{50}$

If the common fraction does not have an exact decimal equivalent, it may be expressed as a combination of a decimal and a fraction, or as a decimal correct to a required number of decimal places.

EXAMPLE 1—Express 1/3 as a decimal.

$$1/3 = \begin{array}{r} 3\overline{)1.0}_{1} \\ .3\frac{1}{3} \end{array} \quad \text{or} \quad \begin{array}{r} 3\overline{)1.000} \\ .333 \end{array}$$ (correct to 3 places of decimals)

EXAMPLE 2—Express 2/3 as a decimal.

$$2/3 = \begin{array}{r} 3\overline{)2.0}_{2} \\ .66\frac{2}{3} \end{array} \quad \text{or} \quad \begin{array}{r} 3\overline{)2.000} \\ .667 \end{array}$$ (correct to 3 places of decimals)

Observe that in Example 2 the last figure has been raised from 6 to 7, the rule being that if the remainder is one-half or more of the divisor, the last figure required is made one more; that is, it is more correct to express $.666\frac{2}{3}$ as .667 than to express it as .666. The same rule explains why the answer remains .333 in Example 1.

1. Express the following fractions as decimals correct to three places.

(1) $\frac{1}{6}$	(2) $\frac{1}{12}$	(3) $\frac{1}{7}$	(4) $\frac{1}{9}$
(5) $7\frac{2}{3}$	(6) $3\frac{5}{12}$	(7) $9\frac{7}{15}$	(8) $14\frac{2}{7}$

2. Express the following fractions as a combination of decimals and fractions.

(1) $\frac{1}{3}$	(2) $\frac{5}{6}$	(3) $3\frac{5}{12}$	(4) $2\frac{7}{9}$
(5) $27\frac{4}{15}$	(6) $1\frac{13}{18}$	(7) $\frac{5}{36}$	(8) $\frac{71}{72}$

To express a combination of decimals and fractions as a common fraction, proceed as in the following example.

EXAMPLE—Express $.33\frac{1}{3}$ as a common fraction.

$$.33\frac{1}{3} = \frac{33\frac{1}{3}}{100} = \frac{100}{3} \div \frac{100}{1} = \frac{100}{3} \times \frac{1}{100} = \frac{1}{3}$$

Express the following decimals as common fractions.

1. $.66\frac{2}{3}$	2. $.16\frac{2}{3}$	3. $.14\frac{2}{7}$	4. $.11\frac{1}{9}$
5. $.8\frac{1}{3}$	6. $.06\frac{1}{4}$	7. $.05\frac{1}{2}$	8. $.12\frac{3}{4}$
9. $.22\frac{2}{9}$	10. $.08\frac{1}{3}$	11. $.28\frac{4}{7}$	12. $.83\frac{1}{3}$
13. $.58\frac{1}{3}$	14. $.81\frac{1}{4}$	15. $.41\frac{2}{3}$	16. $.85\frac{5}{7}$

Addition and Subtraction of Decimal Fractions

In adding decimal numbers, arrange them so that the decimal points are in vertical alignment. The same rule is followed for subtraction.

1. Add the following numbers.

(1)	(2)	(3)	(4)	(5)	(6)
976.1 426.897 63.42 .063 3.096	67.32 712.6 .875 727. 93.42	19.5 638.429 2.633 526.24 9.6	.975 2.637 46.5 9.62 123.456	3.4 197.623 52.34 178. 2.63	96.27 193.5 4.896 152. .5

2. Copy the following numbers in the columns below and add.

(1) 27.02, 1.076, .37, 384.9
(2) 4.635, 256, 128.9, 63.48
(3) 127.9, 42.02, 5.875, .25
(4) 14.634, 2.6, 148.12, 9.375
(5) 2.16, 175.428, 5.6, .417
(6) 117.2, 63.75, 2.745, .5

(1)	(2)	(3)	(4)	(5)	(6)

3. Subtract the following numbers.

(1)	(2)	(3)	(4)	(5)	(6)
785.26 19.39	428.5 163.25	179.527 63.14	142.01 3.009	675.247 98.	126.3 97.465
(7)	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**
.963215 .016202	3.6654 .77001	67.6003 1.0004	215. .6384	6.05621 5.60730	200.1575 9.9999

4. Copy the following numbers in the columns below and subtract.

(1) 496.00 − 29.836
(2) 179.001 − 82.9
(3) 463. − 97.634
(4) 17.2 − 13.051
(5) 217.08 − 121.05
(6) .01 − .0011
(7) 175.3 − 46.481
(8) 287.631 − 89.9
(9) 963.42 − 675.375
(10) 46.003 − 27.456
(11) 119.5 − 3.214
(12) 67.385 − 44.677

(1)	(2)	(3)	(4)	(5)	(6)
(7)	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**

MULTIPLICATION OF DECIMAL FRACTIONS

To multiply decimal fractions:

1. Proceed as with ordinary multiplication.
2. Place the decimal point in the product so that there are as many decimal places in it as in both the factors. If necessary, use zeros to make up the required number.

EXAMPLES—(1) 5 × .5 = 2.5
(2) .5 × .5 = .25
(3) .5 × .05 = .025
(4) .05 × .05 = .0025

Multiply as indicated and total.

1. 6.4 × 12 =
.064 × 12 =
64 × .012 =
.64 × 1.2 =
6.4 × .012 =
Total

2. 125 × .8 =
12.5 × .08 =
1.25 × 8 =
.125 × .008 =
.0125 × .8 =
Total

3. 124 × .11 =
1.24 × .11 =
12.4 × .11 =
.124 × .11 =
.124 × 1.1 =
Total

4. 128 × .009 =
.128 × .09 =
1.28 × 9 =
12.8 × 90 =
1.28 × .09 =
Total

5. 3.24 × .7 =
32.4 × 70 =
.324 × .07 =
324 × .007 =
.0324 × .7 =
Total

6. 123 × .06 =
.123 × .6 =
12.3 × .06 =
1.23 × 6 =
.123 × .006 =
Total

7. 72.951
1.325

8. 3.4269
340.2

9. 986.32
14.68

10. .59684
.1275

11. 457.345
.374

12. 5.3478
4714

13. .1097
.75

14. 5.4584
.3329

DIVISION OF DECIMAL FRACTIONS

1. When the divisor is a whole number, divide as in ordinary division, placing the decimal point immediately above the decimal point in the dividend. There will then be as many decimal places in the quotient as in the dividend.

EXAMPLES— $\begin{array}{r} .45 \\ 5\overline{)2.25} \end{array}$ $\begin{array}{r} .045 \\ 5\overline{).225} \end{array}$ $\begin{array}{r} .0045 \\ 5\overline{).0225} \end{array}$

2. When the divisor is a decimal, move the decimal point to the right in order to make it a whole number. Then move the decimal point in the dividend the same number of places to the right. In effect, we have multiplied the divisor and the dividend by the same power of 10; therefore, the relative values have not been changed.

EXAMPLES— $.5\overline{)\,2.25} = \begin{array}{r} 4.5 \\ 5.\overline{)\,22.5} \end{array}$ $.05\overline{)\,2.25} = \begin{array}{r} 45. \\ 5.\overline{)\,225.} \end{array}$

3. In some cases, it is necessary to add zeros to the dividend in order to complete the quotient.

EXAMPLE— $4\overline{)\,2.6} = \begin{array}{r} .65 \\ 4\overline{)\,2.60} \end{array}$

Observe that the addition of a zero or zeros to the right of the decimal fraction does not change the value of the decimal fraction.

Divide as indicated and total.

1.

$128 \div .08 =$

$1.28 \div 80 =$

$12.8 \div .08 =$

$1.28 \div .8 =$

$.0128 \div .08 =$

Total

2.

$1.44 \div .6 =$

$14.4 \div .06 =$

$144 \div .06 =$

$1.44 \div 60 =$

$.144 \div .6 =$

Total

3.

$1.08 \div 12 =$

$1.08 \div 1.2 =$

$1.08 \div .12 =$

$10.8 \div .012 =$

$108 \div 1.2 =$

Total

4.

$477 \div .9 =$

$47.7 \div 9 =$

$4.77 \div 90 =$

$.477 \div .09 =$

$.477 \div 90 =$

Total

Division of Decimal Fractions

In the spaces below, divide the following by long division, giving the quotient (if it is not already exact) to three decimal places.

1. 3275 ÷ 1.15
2. 784.2 ÷ .347
3. 61.25 ÷ 9.85
4. 97.8 ÷ 4.25
5. 125.6 ÷ 21.375
6. 78.9 ÷ .567

MIXED OPERATIONS WITH FRACTIONS AND DECIMALS

When an expression contains both common fractions and decimal fractions, it will be necessary to express all fractional numbers in the same form.

EXAMPLE—Simplify $.25 + \frac{1}{5}$, giving the result as a common fraction.

$$.25 + \frac{1}{5} = \frac{25}{100} + \frac{1}{5} = \frac{1}{4} + \frac{1}{5} = \frac{5+4}{20} = \frac{9}{20}$$

The result expressed as a decimal would be:

$$.25 + \frac{1}{5} = .25 + .2 = .45$$

1. Simplify the following expressions, showing the results as common fractions.

(1) $.25 + \frac{1}{2}$	(2) $2.5 - \frac{3}{4}$	(3) $.025 \times \frac{4}{5}$	(4) $2.5 \div 1\frac{1}{4}$
(5) $\frac{.03}{\frac{1}{5}}$	(6) $\frac{\frac{1}{5}}{.3}$	(7) $\frac{.3}{15}$	(8) $\frac{.15}{1\frac{4}{5}}$

2. In the spaces below, complete the same problems, expressing the results as decimals.

(1)	(2)	(3)	(4)
(5)	(6)	(7)	(8)

Problems Involving Operations with Decimals

1. If $675 is paid for 7.5 acres of land, what is the price of each acre?

2. If 3.5 pounds of sugar cost 14.875 cents, how much will one pound cost?

3. If a car uses 248 gallons of gasolene in travelling 4098 miles, what is the average mileage per gallon? (Answer to three decimal places.)

4. A school pays $5.25 for a gross (144) of pencils. How much is the cost of one pencil? (Answer to three decimal places.)

5. A cement mixture was made up as follows: gravel, .5, sand, .3; and the remainder, cement. What decimal fraction of the mixture was cement? How many cubic yards of each are there in 20 cubic yards of the mixture?

6. The record of expenditures of a family showed that .25 of the income was spent for rent; .33$\frac{1}{3}$, for food; .16$\frac{2}{3}$, for clothing; .15, for miscellaneous; and the remainder was saved. If the total income for the year was $3600, how much was saved?

1. Add the following numbers.

(a)	(b)	(c)	(d)	(e)
$456.17	$432.19	$289.09	$167.78	$567.35
123.43	567.89	123.32	189.05	178.75
324.45	187.18	123.35	135.35	143.34
545.54	132.25	178.18	325.78	345.45
345.23	678.85	891.15	67.34	555.05
32.46	87.32	87.75	123.36	366.65
123.32	234.45	89.78	324.78	901.11
98.76	98.09	178.45	454.32	99.79
874.32	505.50	89.45	35.35	190.17
143.45	235.56	810.10	99.99	89.87

2. Subtract the following numbers.

(a)	(b)	(c)	(d)	(e)
123.4578	345.67873	98098.456	4.876754	.0378932
97.3411	234.77354	88123.567	.099763	.0087654

3. Multiply the following numbers.

(a)	(b)	(c)	(d)	(e)
134.256	13.23452	3456.43261	.2356784	.0034567
4	5	8	.07	.011

4. Divide the following numbers.

(a) $.4\overline{)42.88}$ (b) $.9\overline{)36.4509}$ (c) $.09\overline{)3.6072}$ (d) $.007\overline{)4.256}$ (e) $.8\overline{).06432}$

5. Express the following common fractions as decimal fractions.

$\frac{1}{2}$ $\frac{1}{3}$ $\frac{1}{8}$ $\frac{1}{12}$ $\frac{1}{9}$

$\frac{2}{3}$ $\frac{4}{5}$ $\frac{3}{8}$ $\frac{5}{8}$ $\frac{1}{4}$

6. Express the following decimal fractions as common fractions.

.125 .0625 .875 $.33\frac{1}{3}$ .5

$.08\frac{1}{3}$ 2.25 4.75 9.05 4.125

7. Complete the following calculations.

.25 of 144 .125 of 64.8 $.33\frac{1}{3}$ of 99 .15 of 300 .375 of 24

.875 of 864 3.5 of 24 $.66\frac{2}{3}$ of 33 .09 of 111 .10 of 1256

UNIT 5

PROBLEMS IN PROPORTION

EXAMPLE 1—If 7 tons of coal cost $185.50, what would 9 tons cost?

The solution to the problem may be set up in either of the following two ways:

Solution A

Since 7 tons cost $185.50

1 ton costs $\frac{\$185.50}{7}$

Therefore, 9 tons cost $9 \times \frac{185.50}{7}$ or $238.50.

Solution B

7 tons cost $185.50

9 tons cost $\frac{9}{7}$ of the cost of 7 tons.

Therefore, 9 tons cost $\frac{9}{7}$ of $185.50 or $238.50.

Using either of these forms of solution, solve the following problems.

1. If a 100-pound bag of sugar costs $7, what would be the cost, proportionately, of 5 pounds?

2. If 100 sheets of paper cost 35 cents, what would be the cost, proportionally, of 15 sheets?

3. If a dozen pencils cost 54 cents, what would be the cost, proportionally, of 4 pencils?

4. If a gallon of oil is worth $2, what would be the value of 3 pints?

5. If $4.80 will buy 6 pounds of butter, how much butter would $1.80 buy?

6. If $25 will buy food for a family of four for one week, what would be the cost, proportionally, for a family of five?

7. A woman bought a case of strawberries (24 boxes) for $6. She sold 5 boxes to her neighbour at cost. What did the neighbour pay for each box?

8. One square yard of material cost $4.95. What would be the cost of 6 square feet cut from the same piece?

9. A person inherited $5000, which was 2/5 of the value of an estate. What was the total value of the estate?

10. If lumber sells at $150 per thousand board feet, how much would a plank 2″ × 8″ × 14′ 0″ cost?

11. If 1½ times the cost of an article is $360, what is the cost of the article?

12. If 1.4 of the value of a house is $9800, what is the value of the house?

13. If .375 of the value of a business is $30,000, what is the value of one half of the business?

14. A person sold a car for $1500, which was ¾ of what he had paid for it. How much had he paid for the car?

15. A gallon of paint will cover 250 square feet of surface. How many quarts will cover 175 square feet?

16. Find the cost of 3 ounces of spice at 40 cents per half-pound.

17. If 8 men can do a piece of work in 5 days, in how many days could 20 men do it?

18. At 60 miles an hour, how many yards would a car travel in 3 seconds?

19. If $15\frac{1}{2}$ pounds of material cost $12.40, what would $2\frac{1}{4}$ pounds cost?

20. An article was sold for $25, which was $1\frac{1}{4}$ times the cost. What was the total cost?

21. The distance from a point A to a point B is 280 miles. This is $1\frac{1}{6}$ times the distance from A to a point C. What is the distance from A to C?

22. George lives $1\frac{1}{2}$ times as far from the school as Peter. If George lives 2 miles away, how far away does Peter live?

Practice in Fundamental Operations

1. Add the following columns of figures. Check until you are sure you are correct.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$3.27	$6.85	$9.68	$4.56	$9.37	$6.89	$7.56	$8.29
8.38	5.72	7.48	8.34	6.28	4.73	9.57	9.46
5.64	8.57	9.37	9.59	2.48	3.85	4.95	5.84
5.74	6.58	4.59	3.47	3.59	2.74	5.94	3.75
9.56	8.76	7.65	6.53	5.34	4.23	9.87	8.76
7.67	6.56	5.45	4.45	3.34	2.23	1.12	9.23
8.34	7.34	6.45	5.56	4.67	3.78	2.89	9.87
2.34	3.45	4.56	5.67	6.78	7.89	8.91	9.23
6.92	7.83	6.74	5.65	9.45	9.54	8.45	8.54
5.85	6.75	7.95	4.85	3.85	2.95	7.45	9.87

2. Complete the following tabulation.

No.	Number of Articles	Cost per Article	Total Cost	No.	Total Cost	Cost per Article	Number of Articles
1	428	$ .12		11	$ 27.81	$ .09	
2	564	.11		12	80.41	.11	
3	937	.09		13	87.60	.12	
4	788	.12		14	113.40	.12	
5	878	.12		15	78.66	.09	
6	756	.11		16	108.57	.11	
7	974	.09		17	88.32	.12	
8	867	.12		18	76.64	.08	
9	765	.09		19	46.26	.09	
10	589	.12		20	103.56	.12	
Totals				Totals			

3. Solve the following problems.

(1)	If 3 units cost $ 9.00, what will 27 units cost?	
(2)	If 28 units cost $ 1.40, what will 42 units cost?	
(3)	If 18 units cost $ 94.50, what will 12 units cost?	
(4)	If 12 units cost $108.60, what will 19 units cost?	
(5)	If 9 units cost $ 83.16, what will 20 units cost?	
	Total	

UNIT 6

PERCENTAGE

PER CENTS EXPRESSED AS FRACTIONS; AND FRACTIONS, AS PER CENTS

The term, "per cent" means "hundredths." Therefore, to express a per cent as a fraction, simply write it with the denominator 100.

EXAMPLE—Express 25 per cent (written as 25%) as a fraction.

$$25\% = \frac{25}{100} = \frac{1}{4}$$

As $\frac{25}{100}$ is, in effect, 25 divided by 100, it follows that to reverse the process or to express a fraction as a per cent, we multiply by 100.

EXAMPLE—Express $\frac{1}{4}$ as a per cent.

$$\frac{1}{4} \times 100 = 25\%$$

FURTHER EXAMPLES—

(1) $100\% = \frac{100}{100} = 1$ (2) $125\% = \frac{125}{100} = 1\frac{1}{4}$ (3) $12\frac{1}{2}\% = \frac{12\frac{1}{2}}{100} = \frac{25}{200} = \frac{1}{8}$

$1 = 1 \times 100 = 100\%$ $1\frac{1}{4} = \frac{5}{4} \times 100 = 125\%$ $\frac{1}{8} = \frac{1}{8} \times 100 = 12\frac{1}{2}\%$

1. Express the following per cents as fractions in their lowest terms.

(1) 20%	(2) 120%	(3) 30%	(4) 160%	(5) 75%	(6) 250%	(7) 35%
(8) $8\frac{1}{3}\%$	(9) $6\frac{1}{4}\%$	(10) $133\frac{1}{3}\%$	(11) $16\frac{2}{3}\%$	(12) $37\frac{1}{2}\%$	(13) $166\frac{2}{3}\%$	(14) $87\frac{1}{2}\%$

2. Express the following fractions as per cents.

(1) $\frac{1}{2}$	(2) $\frac{1}{3}$	(3) $\frac{2}{3}$	(4) $\frac{1}{5}$	(5) $1\frac{4}{5}$	(6) $\frac{3}{8}$	(7) $\frac{9}{25}$
(8) $\frac{31}{50}$	(9) $3\frac{9}{10}$	(10) $\frac{5}{12}$	(11) $2\frac{5}{8}$	(12) $1\frac{3}{4}$	(13) $\frac{3}{16}$	(14) $\frac{5}{6}$

ALIQUOT PARTS OF 100

The preceding worksheet suggests that it would be convenient to have memorized certain commonly used fractional parts of 100. The following table is to be prepared for that purpose; when completed, it will contain several commonly used factors of 100, called *aliquot parts* of 100.

The figures inserted in the spaces are the per cent equivalents of fractions, the numerators of which are in the vertical column to the left, and the denominators are written horizontally above the columns.

For example, the per cent equivalent of $\frac{3}{4}$ is 75, the number in the third space of the "fourths" column.

Complete the following table to the right of the heavy line in the manner of the three lines already filled in, and memorize the equivalents.

Table of Aliquot Parts of 100

	HALVES	THIRDS	FOURTHS	FIFTHS	SIXTHS	EIGHTHS	TENTHS	TWELFTHS	SIXTEENTHS
1	50	$33\frac{1}{3}$	25	20	$16\frac{2}{3}$	$12\frac{1}{2}$	10	$8\frac{1}{3}$	$6\frac{1}{4}$
2	100	$66\frac{2}{3}$	50	40	$33\frac{1}{3}$	25	20	$16\frac{2}{3}$	$12\frac{1}{2}$
3		100	75	60	50	$37\frac{1}{2}$	30	25	$18\frac{3}{4}$
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									

PER CENTS EXPRESSED AS DECIMALS; AND DECIMALS, AS PER CENTS

As we have already learned in the unit on decimal fractions, $\frac{25}{100}$ may also be written as .25. Since $\frac{25}{100}$ also represents 25%, 25% may be written as .25.

Therefore, to express a per cent as a decimal, we insert a decimal point two places to the left.

EXAMPLES—50% = .50; 150% = 1.50; $12\frac{1}{2}\%$ = 12.5% = .125

1. Express the following per cents as decimals.

(1) 12%	(2) $5\frac{1}{2}\%$	(3) 175%	(4) 200%
(5) .5%	(6) $33\frac{1}{3}\%$	(7) $16\frac{2}{3}\%$	(8) $\frac{1}{4}\%$
(9) $\frac{1}{8}\%$	(10) 100%	(11) $37\frac{1}{2}\%$	(12) 3.8%

2. Express the following decimals as per cents.

(1) .28	(2) .375	(3) 1.60	(4) 2.5
(5) .05	(6) .005	(7) 5.00	(8) $.33\frac{1}{3}$
(9) .625	(10) $.16\frac{2}{3}$	(11) $.06\frac{1}{4}$	(12) 3.0

3. In the blank spaces in each line write in the required equivalents.

NO.	FRACTION	DECIMAL	PER CENT	NO.	FRACTION	DECIMAL	PER CENT
1	$\frac{5}{8}$			7			$18\frac{3}{4}\%$
2		.165		8	$\frac{2}{3}$		
3			$4\frac{1}{2}\%$	9		.24	
4	$\frac{1}{16}$			10			$2\frac{3}{4}\%$
5		.1275		11	$\frac{4}{5}$		
6	$\frac{3}{16}$			12		$.41\frac{2}{3}$	

A per cent of a number may be found by one of three methods:

1. By changing the per cent to a fraction.
2. By changing the per cent to a decimal.
3. By the 1% method.

The simplest method should always be used. Method 1 will be found most convenient in the solution of the exercises on this page.

EXAMPLE—Find 25% of 24.

$$25\% = \frac{25}{100} \text{ or } \frac{1}{4}$$

$$\frac{1}{4} \text{ of } 24 = 6$$

Using Method 1, (changing the per cent to a fraction), calculate the following percentages. Refer to your table of aliquot parts for equivalent fractions of 100.

1. 50% of 250	2. 75% of 120	3. $33\frac{1}{3}\%$ of 360	4. $66\frac{2}{3}\%$ of 480
5. $12\frac{1}{2}\%$ of 48	6. $37\frac{1}{2}\%$ of 160	7. $62\frac{1}{2}\%$ of 56	8. $87\frac{1}{2}\%$ of 96
9. $8\frac{1}{3}\%$ of 60	10. $16\frac{2}{3}\%$ of 36	11. $6\frac{1}{4}\%$ of 32	12. $18\frac{3}{4}\%$ of 80
13. $37\frac{1}{2}\%$ of 1600	14. $33\frac{1}{3}\%$ of 750	15. $66\frac{2}{3}\%$ of 210	16. $87\frac{1}{2}\%$ of 32
17. $41\frac{2}{3}\%$ of 720	18. $83\frac{1}{3}\%$ of 36	19. $58\frac{1}{3}\%$ of 12	20. $91\frac{2}{3}\%$ of 24

CALCULATING A PER CENT OF A NUMBER

METHOD 2—Changing the Per Cent to a Decimal.

This method may be the more convenient when the per cent is not an exact fraction in low terms.

EXAMPLE—Find 36% of 70.

$36\% = .36$

$.36 \times 70 = 25.20 \text{ or } 25\frac{1}{5}$

Using Method 2 (changing the per cent to a decimal), calculate the following percentages.

1. 8% of 20	2. 12% of 30	3. 13% of 24	4. 15% of 220
5. 17% of 17	6. 21% of 270	7. 18% of 50	8. 22% of 250
9. 16% of 225	10. 32% of 16.25	11. 9% of 42½	12. 2½% of 28
13. 1.5% of 80	14. 30% of 140	15. 60% of 75	16. 45% of 120
17. 150% of 32	18. 175% of 96	19. 3½% of 150	20. 4.25% of 600
21. .5% of 1000	22. .25% of 1000	23. 28% of 70	24. 120% of 320

METHOD 3—The 1% method.

Find 2% of 1600.

1% of 1600 = 16.   (Find 1% by moving the decimal point two places to the left.)

2% of 1600 = 2 × 16 = 32

It will be noticed that although Method 1, (changing the per cent to a fraction) is, without question, the easiest method with certain per cent values, there is little difference in difficulty between Methods 2 and 3.

Using Method 3 (the 1% method), find the following percentages.

1. 3% of 500	2. 8% of 250	3. 5% of 2100	4. 4% of 280
5. ½% of 184	6. 14% of 820	7. 40% of 30	8. 7% of 50
9. 2½% of 85	10. 35% of 16	11. 22% of 300	12. 7.5% of 80
13. 19% of 800	14. 13% of 700	15. 18% of 22	16. 5½% of 3600
17. ⅛% of 480	18. ¼% of 360	19. 3½% of 300	20. 4½% of 280

FINDING WHAT PER CENT ONE NUMBER IS OF ANOTHER

EXAMPLE—What per cent is \$25 of \$125?

This is a problem in proportion—\$25 of \$125 is how many dollars of \$100? The problem may be solved by either of the two methods already illustrated in the unit on *proportion.*

METHOD 1

$$\$125 = 100\%$$

$$\$1 = \frac{100}{125}\%$$

$$\$25 = 25 \times \frac{100}{125} = 20\%$$

METHOD 2

$$\$125 = 100\%$$

$$\$25 = \frac{25}{125} \text{ or } \frac{1}{5} \text{ of } 100\%$$

$$= 20\%$$

In each of the following exercises, find what per cent the first number is of the second. Use the method that appears to be the easier.

1. 20 of 60
2. 8 of 200
3. 12 of 96
4. 125 of 1000
5. 13 of 65
6. 60 of 480
7. 210 of 140
8. 1.5 of 6
9. 255 of 85
10. 19 of 38
11. 600 of 125
12. ⅔ of 2

13. 9 inches of 1 yard

14. 1 furlong of 1 mile

15. 100 yards of 1 mile

16. 84 sq. in. of 1 sq. ft.

17. 108 sq. in. of 1 sq. yd.

18. 480 acres of 1 sq. mile

19. 9 cu. ft. of 1 cu. yd.

20. 3 pints of 1 gallon

21. 40 hours of one week

22. 2 doz. of 1 gross

23. 18 of 1 dozen

24. 37 marks out of 75

25. 18 marks out of 25

26. 13 marks out of 20

27. 38 marks out of 40

GIVEN THE PER CENT VALUE OF A NUMBER, FIND THE NUMBER

EXAMPLE—25% of a number is 40. Find the number.

This again is a problem of proportion which may be solved by either of the two methods described.

Method 1

$$\begin{aligned} 25\% \text{ of the number} &= 40 \\ 1\% \text{ of the number} &= \frac{40}{25} \\ 100\% \text{ of the number} &= \frac{100 \times 40}{25} \\ &= 160 \end{aligned}$$

Method 2

25% of the number is 40

$$\begin{aligned} 100\% &= \frac{100}{25} \text{ of } 40 \\ &= 160 \end{aligned}$$

Using either Method 1 or Method 2, solve the following problems.

1. \$9 is 10% of what amount?	2. \$8 is 40% of what amount?	3. \$125 is 20% of what amount?
4. 45 is 2% of what number?	5. 6 is $8\frac{1}{3}$% of what number?	6. 2400 is $83\frac{1}{3}$% of what number?
7. 7 is $87\frac{1}{2}$% of what number?	8. 160 is $6\frac{1}{4}$% of what number?	9. 36 is $16\frac{2}{3}$% of what number?
10. 480 is $37\frac{1}{2}$% of what number?	11. 10 is $\frac{1}{2}$% of what number?	12. .15 is $\frac{1}{8}$% of what number?

GIVEN THE PER CENT VALUE OF A NUMBER, FIND THE NUMBER

13. 9 inches is 75% of how many feet?

14. 18 inches is 25% of how many yards?

15. 80 acres is 6¼% of how many sq. miles?

16. 100 lbs. is 2½% of how many tons?

17. 4 oz. is 5% of how many pounds?

18. 3 qts. is 16⅔% of how many gallons?

19. 64 cu. in. is 2% of how many cu. ft.?

20. 9 cu. ft. is 10% of how many cu. yd.?

21. 18 miles is 12½% of how many miles?

22. 8 doz. is 20% of how many gross?

23. 30 rods is 50% of how many yards?

24. 2 lb. is 25% of how many ounces?

25. 15 minutes is 10% of how many hours?

26. 12 cents is 2½% of how many dollars?

27. 10 cents is 5% of how many dollars?

Miscellaneous Problems

Show the solutions for these problems in the spaces provided.

1. A person earning $1.40 an hour has received a 5% raise. What is the new rate per hour?

2. A house worth $12,500 is insured for $9000. For what per cent of its value is it insured?

3. A person's rent was 30% of his income. If the rent was $75 per month, what was the monthly income?

4. What is the present value of a car which cost $2500 and has depreciated 30% of its cost?

5. A person inherited $6250, which was 12½% of the estate. What was the value of the estate?

6. A person earning $1.60 an hour received a raise of 10 cents an hour. What was the per cent raise?

7. A person received $150 a year interest on a 3% government bond. What was the amount of the bond?

8. A class is made up of 21 girls and 14 boys. What per cent of the total are boys?

9. A man bought a house for $7200 and sold it for $8400. What per cent profit did he make on the transaction?

10. If a business had sales of $8500 and the operating expenses were 20% of the sales, how much were the expenses?

11. An office worker earning $125 a month received a raise of $25 a month. What was the per cent raise?

12. An article is priced to sell at $300. If government taxes make up 37½% of the selling price, how much of the price goes for taxes?

13. A worker earns $1.50 an hour. Which would be the better offer: a raise of 10 cents an hour, or an 8% increase?

14. In the first week of its drive, a Community Fund campaign raised $80,000. If this was 40% of its objective, what was the objective?

15. A car bought for $2400 was sold, after being used for one year, for $1800. What per cent had it depreciated?

16. A school had a total of 1750 pupils. If 500 of the pupils were girls, what percentage of the total enrolment consisted of boys?

17. Out of a possible total of 650 marks, a student received 525. What per cent did he make?

18. A typist who could type 35 words a minute increased her speed to 50 words a minute. What was the per cent increase?

19. A salesman earned $125 in one week. Of this $50 was salary. The rest was commission at the rate of 5% of his sales. What were the sales?

20. In 1954 a factory produced 75,000 units. If this was 125% of the 1950 production, how many units were produced in 1950?

21. If the cost of food drops an average of 5%, how much can be saved out of an annual salary of $3600, of which 33⅓% has been allocated for food?

22. The 1954 rate of wages in a certain industry was $1.80 per hour. If this is 225% of what the wage was in 1939, what was the rate in 1939?

23. If a man earns $5000 a year and pays $510 for income tax, what per cent of his income goes for income tax?

24. An article which costs $85 in the United States is imported into Canada. After paying a customs duty of 30% of the cost and a sales tax of 10% on the duty-paid value (cost in U.S. plus duty), what is the imported cost?

Practice in Fundamental Operations

1. Add the following exercises.

(1)	(2)	(3)	(4)	(5)
$123.86	$323.51	$567.56	$565.50	$432.25
111.23	118.85	342.34	564.23	134.55
98.67	23.35	134.43	187.50	132.11
432.32	195.55	198.55	807.45	345.45
181.31	181.15	234.56	891.09	187.55
324.45	181.18	345.43	980.78	348.87

2. Complete the following exercises.

(1) 2% of 180 =
1% of 217 =
½% of 144 =
2½% of 600 =
3% of 117 = ______
Total ______

(2) 1% of 317 =
1/8% of 160 =
1/4% of 360 =
1/16% of 320 =
2% of 111 = ______
Total ______

(3) 10% of 182 =
20% of 155 =
25% of 240 =
75% of 160 =
100% of 187 = ______
Total ______

3. Complete the following exercises.

(1)
If 3% of a sum is $12, the sum is ______
If ½% " " " " $13, " " " ______
If 11% " " " " $55, " " " ______
If ¼% " " " " $20, " " " ______
If 1/10% " " " $9, " " " ______

(2)
If 125% of a sum is $250, the sum is ______
If 110% " " " " $330, " " " ______
If 100½%" " " " $603, " " " ______
If 200% " " " " $42, " " " ______
If 250% " " " " $500, " " " ______

4. Complete the following exercises.

(1)
6 is ______ % of 30
12 is ______ % of 36
15 is ______ % of 90
11 is ______ % of 22
13 is ______ % of 65

(2)
3 is ______ % of 9
7 is ______ % of 28
1 is ______ % of 2
8 is ______ % of 64
4 is ______ % of 4

(3)
½ is ______ % of 4
¼ is ______ % of 10
8 is ______ % of 4
9 is ______ % of 3
12 is ______ % of 10

5. Complete the following exercises, filling in fractional, decimal, and per cent equivalents.

(1)
1/4 = %= .
1/5 = %= .
1/6 = %= .
1/8 = %= .
1/12 = %= .

(2)
.37½ = %= /
.62½ = %= /
.40 = %= /
.87½ = %= /
.33⅓ = %= /

(3)
12% = = /
15% = = /
50% = = /
66⅔% = = /
125% = = /

UNIT 7

BUSINESS APPLICATIONS OF PERCENTAGE

Cash Discounts

A cash discount is a deduction allowed for payment of a bill before a specified date. For example, the Local Utilities Commission allows a 10% discount from the gross amount of bills for electricity if paid by a certain date.

Example— Gross $7.70 Net $6.93—if paid by June 9, 19—

10% of 7.70 = .77; 7.70 − 77 = 6.93

1. Find the discount and the amount of the following electricity bills, allowing 10% off the gross amount in each case.

No.	Gross		Discount at 10%		Net Amount		No.	Gross		Discount at 10%		Net Amount	
1.	12	10					6.	8	76				
2.	14	15					7.	10	58				
3.	9	83					8.	12	78				
4.	11	65					9.	13	20				
5.	13	40					10.	11	90				

Wholesale companies sometimes allow the retailer a cash discount for payment within a specified time. The terms of discount are usually stated on the invoice and may vary in the length of time allowed for discount. A common term of discount is 2/10, n/30.

The n/30 means that 30 days are allowed for the payment of the invoice; the 2/10 means that 2% will be deducted if the invoice is paid within 10 days from the date of the invoice.

The invoice shown illustrates the use of these terms.

ANTHONY PETERS
Wholesale Fruit & Vegetables
Windsor, Ontario

Sold to Students' Fruit Market
20 Madison Avenue
Windsor, Ontario

Date February 1, 19__
Terms 2/10, n/30

4 cases	Oranges	@	$7.20		
25 lb.	Bananas	@	.15		
2 cases	Grapefruit	@	6.00		

2. Make the extensions in the above invoice, and find the amount required to pay the bill in full on (a) February 5, 19— $.........., and (b) February 28, 19— $..........

Headings are omitted from the following invoices, but the date, terms, items and prices are given. Complete the extensions, total, and find the amount of payment on the date paid.

1. Date: Jan. 5, 19__ Terms: 2/10, n/30

25 gal.	Lemon Oil Polish	@	$2.15		
120 lb.	Waxcote	@	.84		

Paid January 15, 19__

Amount paid $________

2.

Date: Jan. 8, 19-- Terms: 3/10, n/30

50 Brown Nesting Chairs @ $ 4.00
10 Nesting Tables @ 12.00

Paid January 15, 19–
Amount paid $________

3.

Date: Jan. 20, 19-- Terms: 2/20, n/60

12 Nesting Tables @ $15.50
120 Brown Nesting Chairs @ 5.00

Paid February 3, 19–
Amount paid $________

4.

Date: Jan. 8, 19-- Terms: 3/10, 1/30, n/60

12 pairs Boxing Gloves @ $21.50
6 Boxing Head Guards @ 7.50

Paid January 15, 19–
Amount paid $________

5.

Date: Jan. 20, 19-- Terms: 3/10, 1/30, n/60

4 Juvenile Boys' Bicycles @ $37.50
4 Juvenile Girls' Bicycles @ $35.50

Paid February 5, 19–
Amount paid $________

6. According to the amounts and terms of the invoices listed below, find the discount, if any, and the amount paid. Use a scratch pad for the calculations.

No.	TOTAL OF INVOICE		DATE OF INVOICE	TERMS	DATE PAID	CASH DISCOUNT		AMOUNT PAID	
1	180	00	Jan 2/–	2/10, n/30	Jan 8/–				
2	496	50	Jan 10/–	5/10, n/30	Jan 15/–				
3	26	95	Jan 12/–	1/30, n/60	Feb 15/–				
4	1265	80	Jan 15/–	3/10, 1/30, n/60	Jan 20/–				
5	527	00	Jan 20/–	3/10, 1/30, n/60	Feb 28/–				
6	298	75	Jan 30/–	2/10, n/30	Feb 10/–				
7	193	60	Jan 31/–	1/10, n/30	Feb 20/–				

PROFIT AND LOSS

Goods are sold at a profit when the selling price is greater than the cost price. A loss occurs when the selling price is less than the cost. Profit or loss is usually expressed in terms of per cent as well as in dollars and cents.

EXAMPLE 1—Goods costing $50 are sold at a profit of 30% of cost. Find the selling price.
Cost = $50
Profit = 30% of $50 = 30/100 of $50 = $15
Selling price = $50 + $15 = $65

EXAMPLE 2—Goods costing $50 are sold at a loss of 30% of cost. Find the selling price.
Cost = $50
Loss = 30% of $50 = $15
Selling price = $50 − $15 = $35

1. Calculate the profit or loss and the selling price in each of the following exercises. Show the complete solution for each.

(1) Goods costing $180 are sold at a profit of 25% of cost.	(2) Goods costing $250 are sold at a loss of 5% of cost.
(3) A loss of 10% is taken on goods which cost $215.	(4) A profit of 15% is made on goods costing $80.

2. Fill in the blank columns.

No.	Cost		Per Cent Gain or Loss	Amount Gain or Loss		Selling Price		No.	Cost		Per Cent Gain or Loss	Amount Gain or Loss		Selling Price	
1	75	00	20% gain					6	36	00	3% loss				
2	110	00	2% loss					7	148	00	40% gain				
3	345	00	25% gain					8	216	00	25% gain				
4	192	00	12½% gain					9	96	00	8⅓% loss				
5	185	00	5% loss					10	150	00	120% gain				

When the gain or loss is given in dollars, it may be desirable to have it expressed also as per cent.

EXAMPLE—Goods costing \$25 were sold for \$30. What is the per cent profit on cost?

Cost = \$25
Selling price = \$30
Profit = \$30 − \$25 = \$5

$$\text{Per cent profit on cost} = \frac{5}{25} \times 100 = 20\%$$

1. Calculate the per cent gain or loss on cost in each of the following exercises. Show a complete solution for each.

(1) Goods costing \$45 are sold for \$60.	(2) Goods costing \$5 are sold for \$6.25.
(3) A profit of \$8 was made on goods costing \$64.	(4) A loss of \$4 was taken on goods which cost \$20.

2. Fill in the blank columns in the following as required. Indicate gain by the letter "G," loss by the letter "L."

No.	Cost		Selling Price		Gain or Loss		Gain or Loss Per cent	No.	Cost		Selling Price		Gain or Loss		Gain or Loss Per cent
1	24	00	36	00				9		15		10			
2	96	00	108	00				10	35	00	40	00			
3	4	50	6	75				11	40	00	35	00			
4	44	00	88	00				12	25	00	62	50			
5	125	00	150	00				13	20	00	18	00			
6	85	00	100	00				14	250	00	260	00			
7	72	00	90	00				15	117	30	156	40			
8	2	25	2	00				16	29	16	36	45			

Profit and Loss

When the per cent of gain or loss is given and also the gain or loss in dollars and cents, the cost price and selling price may be found as in the following example.

Example—By selling an article at $5 above cost, 20% profit was made. What was the cost and the selling price?

Either of two solutions may be used.

Method 1

Profit = 20% of cost = $5
Cost = 100%
Therefore, cost = $\frac{100}{20}$ of 5 = $25

Method 2

Since 20% of cost = $5
Therefore, 1% = $\frac{5}{20}$
Therefore, 100% = $\frac{5}{20} \times 100$ = $25

1. Calculate the cost and the selling price in each of the following exercises. Show a complete solution for each.

(1) A profit of $20 was made by selling at 20% above cost.

(2) By selling at 10% below cost, the seller lost $5.

(3) At 30% above cost, a profit of $24 was made.

(4) A merchant's goods were sold at 40% above his cost. His profit was $1000.

2. Fill in the Cost and Selling Price columns.

No.	Cost		Selling Price		Gain or Loss % on Cost	Amount Gain or Loss		No.	Cost		Selling Price		Gain or Loss % on Cost	Amount Gain or Loss	
1					25% profit	16	00	8					8% profit	12	00
2					5% loss	2	50	9					10% loss		50
3					32% profit		64	10					50% loss	2	00
4					50% profit	18	00	11					18% profit	3	60
5					2% loss	20	00	12					33⅓% profit	10	00
6					100% profit	15	00	13					3% loss	1	20
7					150% profit	3	00	14					6% profit	6	60

PROBLEMS IN PERCENTAGE

1. A package of breakfast food costs the grocer 10 cents. At what price must he sell it to gain 20% of the cost?

....

....

2. Goods that cost $160 were sold for $200. What was the profit in per cent on the cost?

....

....

3. By paying a bill within the discount period, $1 was saved. The rate of cash discount was 10%. What was the gross amount of the bill?

....

....

4. A merchant marks up his goods 40% above cost. During March he sold goods which had cost him $2500. What was the profit?

....

....

5. A house that cost $7500 was sold six months later for $8000. What was the gain per cent on cost?

....

....

6. To sell articles which cost him 25 cents each, a dealer had to sell at 16% below cost. What was the selling price?

....

....

7. A dealer sold goods which cost him $3000 at a profit of 30% on cost. His expenses were $600. What was his gain?

....

....

8. A dealer sold a 10-pound bag of sugar for 70 cents. If it cost him $5\frac{1}{2}$¢ a pound, what was his gain in per cent on the cost?

....

....

9. An invoice of goods amounted to $350. What did the buyer save by taking a 2% discount?

....

....

10. Goods costing $25 were marked up 20% above cost. Because the goods did not sell readily, the price was dropped 10% of the selling price. What was the actual selling price?

....

....

11. A retail merchant took advantage of a 3% cash discount on an invoice of goods and thereby saved $12. What was the gross amount of the invoice?

....

....

12. A merchant's sales amounted to $5250. The goods cost him $4000. What was the per cent of profit on cost?

....

....

13. On goods which cost him $1200, a merchant requires a profit of 15% on cost to cover business expenses and an additional 10% profit on cost for himself. For how much must he sell the goods?

14. Goods that cost $10 were marked up to $15 and then reduced to $12. What was the profit in per cent on cost at the reduced price? What per cent of the first selling price was the reduction?

15. On goods that were sold at 33⅓% above cost, a merchant made a profit of $300. What was the cost of the goods sold?

16. The retailer's cost for some kitchenware was $26.50. He marked it to sell at $40. When it was not sold, he reduced the selling price 20%. What was the new selling price?

17. Sugar bought at $5.75 a hundred pounds was sold in 5-pound packages at 32 cents a package. What was the profit in per cent?

18. A merchant's purchases for the month of December were $3580 at invoice cost. If he took advantage of a 1½% cash discount on all invoices, how much did he pay for the goods he purchased?

1. In the blank spaces below fill in the required equivalents.

No.	Common Fraction	Decimal Fraction	Per cent	No.	Common Fraction	Decimal Fraction	Per cent	No.	Common Fraction	Decimal Fraction	Per cent
1	1/4			11	1/8			21	1/5		
2		.17		12		.15		22		.45	
3			50	13			75	23			5½
4	1/20			14		.025		24		.07	
5	1/16			15	1/33⅓			25	1/8		
6			12	16			1½	26			6
7	1/150			17	3/20			27	3/8		
8		.04		18		.055		28		.08	
9	1/200			19			6¾	29	5/4		
10	7/2			20		.005		30		1.25	

2. Simplify the following expressions.

(1) $\$452 \times .05$	(2) $\$325 \times \frac{6}{100}$	(3) $\$175 \times 8\%$	(4) $\$535.60 \times \frac{5}{12}$
(5) $\$928.24 \times 6\%$	(6) $\$625.80 \times \frac{11}{12}$	(7) $\$30 \times 5\frac{1}{2}\%$	(8) $\$219 \times \frac{15}{365}$
(9) $\$437 \times \frac{30}{365}$	(10) $\$675.20 \times \frac{73}{365}$	(11) $\$826.30 \times \frac{146}{365}$	(12) $\$425.60 \times \frac{292}{365}$
(13) $\$30 \times \frac{6}{100} \times 50$	(14) $\$500 \times \frac{3\frac{1}{2}}{100} \times 8$	(15) $\$250 \times .03 \times 5$	(16) $\$125 \times 3\frac{1}{2}\% \times 2$

Interest is a charge for the use of money.

The *principal* is the sum on which the interest is paid.

The interest *rate* is expressed as a per cent, because it is the amount charged for the use of $100 for *one year.*

EXAMPLE—Find the interest on $300 at 5% for 2 years.

The interest on $100 for 1 year at 5% = $5.00

The interest on $300 for 1 year at 5% = $\frac{\$300}{100} \times \$5.00 = \$15.00$

The interest on $300 for 2 years at 5% = $15.00 × 2 = $30.00

Therefore, the solution resolves itself as follows:

Interest = Principal × Rate × Time in years.
= 300 × .05 × 2 = $30.00

Observe that the rate in per cent may be expressed either as a decimal fraction (.05) or as a common fraction (5/100). Either will give a correct solution. The student should use the method which is easier in any particular case.

Using the above formula, find the simple interest in the following exercises. Show your solution at the left, and your calculations at the right.

1. $500 at 6% for 5 years.

2. $625.50 at 4% for 4 years.

3. $254.80 at $5\frac{1}{2}$% for 10 years.

SIMPLE INTEREST

The time for which interest is calculated is sometimes expressed in months. To find the interest, express the months as years.

EXAMPLE—Find the interest on $300 at 5% for 6 months.

Interest on $100 at 5% for 1 year = $5.00

Interest on $100 at 5% for ½ year = ½ of $5.00 = $2.50

Interest on $300 at 5% for ½ year $= \frac{300}{100} \times 2.50 =$ $7.50

Or applying the formula directly — Interest = Principal × Rate × Time (time expressed as years):

Interest = $300 × .05 × ½ = $7.50.

Find the interest in the following exercises. Show the solution at the left and your calculations at the right.

1. $825 at 5% for 6 months.

2. $960 at 3½% for 3 months.

3. $800 at 2¾% for 5 months.

4. $250 at 4% for 2 years 9 months.

SIMPLE INTEREST

Interest may have to be calculated for a period of days.

Example—Find the interest on \$219 at 6% for 30 days.

$$\text{Interest} = \text{Principal} \times \text{Rate} \times \text{Time} \quad \text{(in years)}$$

$$= \$\overset{3}{\cancel{219}} \times .06 \times \frac{\overset{6}{\cancel{30}}}{\underset{\underset{1}{\cancel{5}}}{\cancel{365}}} = \$1.08$$

Observe that 73 is a common factor of 365 and 219.

Find the interest in the following exercises. Show your solution at the left and your calculations at the right.

1. \$225 at 5% for 146 days.

....

....

....

2. \$1600 at $3\frac{1}{2}$% for 292 days.

....

....

....

3. \$500 at 6% for 30 days.

....

....

....

4. \$800 at $2\frac{3}{4}$% for 60 days.

....

....

....

5. \$135 at 7% for 137 days.

....

....

....

SIMPLE INTEREST

In the following problems, set up the form of the solution in the space provided and write in the answer. If necessary, use a scratch pad for additional calculations.

1. $460 at 4% for 3 years.

2. $280.90 at 3½% for 2 years.

3. $1250 at 7% for 10 years.

4. $1500 at 2¾% for 15 years.

5. $750 at 6% for 2 months.

6. $480.50 at 5½% for 4 months.

7. $345.00 at 7% for 10 months.

8. $275.00 at 1½% for 1 year, 3 months.

9. $615.00 at 8% for 3 years, 5 months.

10. $296.50 at 6½% for 2 years, 4 months.

11. $300 at 3% for 192 days.

12. $90.20 at 7% for 126 days.

PROBLEMS IN SIMPLE INTEREST

Show solutions for the following problems.

1. John lent Bill $10 for 30 days at 6%. How much should Bill pay to John when payment becomes due?

2. The mortgage on a house is $3150. The interest, at 7% per annum, is payable half-yearly. How much interest will be payable at the end of six months?

3. George inherited $5000 in 3% government bonds. If he holds the bonds for 10 years, how much interest will he collect?

4. What would be the interest for 6 months on 2¾% government bonds to the value of $2500?

5. L. Smith borrowed $500 from N. Norris for 6 years, and paid him interest half-yearly at the rate of 6% per annum. (a) How much interest does he pay half-yearly? (b) What would be the total interest for the 6 years?

6. A man borrowed $250 from his bank at 6% per annum for a period of 90 days. How much is the interest for the period?

1. Add

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$4.28	$5.97	$5.38	$6.94	$4.86	$6.85	$7.39	$4.62
5.83	9.76	4.96	2.59	4.84	6.95	3.86	1.97
1.57	1.76	4.18	4.95	6.17	5.19	3.91	7.98
5.84	9.76	5.84	4.58	5.79	9.47	9.75	8.75
6.58	6.95	8.59	9.15	5.19	4.75	3.86	3.75
8.35	8.45	8.76	8.59	8.76	8.34	8.59	8.75
5.67	5.97	5.46	5.87	5.48	5.68	5.38	5.28
6.47	6.95	6.84	6.28	6.93	6.84	6.75	6.92
3.58	4.89	5.43	6.98	7.65	8.75	9.85	4.59
9.82	9.46	9.41	9.58	9.46	9.75	9.25	9.35

2. Find the net amount after the discount has been deducted. Total the proving columns and check for accuracy.

No.	NUMBER OF ARTICLES	PRICE PER ARTICLE	GROSS AMOUNT	PER CENT DISCOUNT	AMOUNT OF DISCOUNT	NET AMOUNT
1	27	$1.25		5%		
2	40	2.33		10%		
3	29	1.15		5%		
4	24	2.21		20%		
5	22	1.19		2%		
6	126	3.50		3%		

3. Find the selling price. Total the proving columns and check for accuracy.

No.	NUMBER OF ARTICLES	PRICE PER ARTICLE	COST PRICE	PER CENT PROFIT ON COST	AMOUNT OF PROFIT	SELLING PRICE
1	44	$ .15		25%		
2	65	2.45		37½%		
3	75	.62		10%		
4	95	.75		30%		
5	35	1.57		40%		
6	115	2.85		35%		

UNIT 8

ARITHMETIC OF BANKING

THE SAVINGS ACCOUNT DEPOSIT SLIP

When a deposit is made, the bills should be placed in order by denomination, face up; the coin should be rolled in wrappers before a deposit slip is filled in. If out-of-town cheques are deposited, exchange is charged, and this may be deducted from the deposit.

EXAMPLE—Prepare a deposit slip for the following deposit on June 30, 1954, by the Collegiate Council.

Canadian Bank

June 30 19 54

Credit Collegiate Council

25 × $1	25	00
16 × 2	32	00
7 × 5	35	00
8 × 10	80	00
3 × 20	60	00
1 × 50	50	00
Silver	141	25
Copper	7	21
Total	430	46
Cheques	168	40
Total	598	86
Less Exchange		47
Net Deposit	598	39

25	one	dollar	bills
16	two	"	"
7	five	"	"
8	ten	"	"
3	twenty		"
1	fifty	"	"
Silver,		$141.25	
Copper,		7.21	
Cheques,		168.40	
Exchange,		.47	

EXERCISE—Use the deposit slips below to complete the following deposits. Use the current date.

No.	$1	$2	$5	$10	$20	$50	SILVER	COPPER	CHEQUES	EXCH'GE
1	17	12	5	9	3	2	$61.45	$3.98	$161.41	.36
2	42	8	7	6	5	3	91.88	4.08	291.40	.48
3	71	19	8	7	6	—	25.43	1.44	68.14	.15
4	93	21	11	3	2	2	62.40	2.71	462.80	.67

1.

Canadian Bank

__________ 19___

Credit__________

× $1
× 2
× 5
× 10
× 20
× 50
Silver
Copper
Total
Cheques
Total
Less Exch'ge
Net Deposit

2.

Canadian Bank

__________ 19___

Credit__________

× $1
× 2
× 5
× 10
× 20
× 50
Silver
Copper
Total
Cheques
Total
Less Exch'ge
Net Deposit

3.

Canadian Bank

__________ 19___

Credit__________

× $1
× 2
× 5
× 10
× 20
× 50
Silver
Copper
Total
Cheques
Total
Less Exch'ge
Net Deposit

4.

Canadian Bank

__________ 19___

Credit__________

× $1
× 2
× 5
× 10
× 20
× 50
Silver
Copper
Total
Cheques
Total
Less Exch'ge
Net Deposit

THE SAVINGS ACCOUNT CHEQUES

Cheques should be written carefully; the stub should be filled in before the cheque is written. The balance should be carried forward on each stub, and any deposits should be added to the previous balance.

EXAMPLE—Fill in a cheque, dated June 3, 1954, for $53.50, payable to the Varsity Bike Shop, for a bicycle. The previous balance was $61.43, and since the last cheque was issued, a deposit of $17.50 was made.

No. 1
June 3, 1954
To Varsity Bike Shop
For Bicycle

Bal. Forward	61	43
Am't Deposit	17	50
Total	78	93
Am't Cheque	53	50
Balance	25	43

Yourtown, Ont. June 3, 1954 No. 1

The CANADIAN BANK

Pay to order of Varsity Bike Shop---------------- $53.50

Fifty-three--------------------50/100 DOLLARS

Acct. No. 4761 *Jack Johnson*

EXERCISE—Carry forward the balance shown on the stub in the illustration above. Complete cheques for the following payments:
June 18, to Smith & Co., $7.50, for a baseball glove.
" 23, to New-Style Shop, $4.95, for a shirt; record a deposit of $20.00.
" 28, to Pinewood Camp, $15.00, for one week at camp.

No.____
______19__
To ______
For______

Bal. Forward		
Am't Deposit		
Total		
Am't Cheque		
Balance		

Yourtown, Ont.______19__ No.____

The CANADIAN BANK

Pay to order of____________$____

____________DOLLARS

Acct. No.______ ________

No.____
______19__
To ______
For______

Bal. Forward		
Am't Deposit		
Total		
Am't Cheque		
Balance		

Yourtown, Ont.______19__ No.____

The CANADIAN BANK

Pay to order of____________$____

____________DOLLARS

Acct. No.______ ________

No.____
______19__
To ______
For______

Bal. Forward		
Am't Deposit		
Total		
Am't Cheque		
Balance		

Yourtown, Ont.______19__ No.____

The CANADIAN BANK

Pay to order of____________$____

____________DOLLARS

Acct. No.______ ________

The Bank Reconciliation Statement

When the treasurer of an organization makes his report, he must show proof of the balance of cash on hand. The bank will supply him with a statement or a Pass Book. However, the balance shown by the bank may be different to that appearing on the cheque stub or in the cash book record. This difference is usually the result of cheques which have not reached the bank (outstanding cheques) not being recorded, service charges made by the bank, and interest added during the period. To explain the difference, the treasurer prepares a Bank Reconciliation Statement.

Example—On June 30, 19—, the Student Council's Cheque Stub record showed a balance of $718.36. The Bank Pass Book showed a balance of $739.68. Upon checking, it was discovered that cheques No. 17, $2.75, and No. 18, $14.36 had not been deducted by the bank; and the bank had added interest of $4.21. Prepare a Bank Reconciliation Statement.

Bank Reconciliation Statement
June 30, 19—

Balance shown in Pass Book			$739.68
Deduct Outstanding Cheques,	No. 17	$ 2.75	
	No. 18	14.36	17.11
True Cash Balance			$722.57
Balance shown on Cheque Stub		$718.36	
Add Interest		4.21	
True Cash Balance			$722.57

Exercise—Prepare the following Bank Reconciliation Statements.

1. On July 31, the Student Council's Cheque Stub balance was $619.50. The Bank Pass Book showed a balance of $801.19. Upon examination, it is discovered that cheques No. 37, $54.00, No. 39, $66.10, and No. 43, $61.59 are outstanding.

2. On December 31, the Students Bowling Club had a balance on its cheque stubs of $171.23. The Bank Pass Book showed a balance of $200.01. Upon examination, it is discovered that cheques No. 11, $15.00, and No. 12, $11.60 are outstanding. In addition, the bank has credited interest of $2.18 to the account.

INTEREST ON SAVINGS ACCOUNTS

The banks pay interest for the use of money deposited in Savings Accounts. Interest is calculated on the minimum quarterly balance, which is the smallest amount on deposit at any time in a three-month period. It is calculated and added twice a year. The current rate is 2 per cent per annum.

EXAMPLE—The minimum quarterly balances of a savings account on April 30 are:
First Quarter—Nov., Dec., Jan. $242.60
Second Quarter—Feb., Mar., Apr. $164.00
Calculate the interest at 2 per cent per annum.

Interest for first quarter $242.60 × .02 × $\frac{1}{4}$ = $1.21
Interest for second quarter $164.00 × .02 × $\frac{1}{4}$ = .82
Interest to be added on May 31, $2.03

EXERCISE—Calculate the interest on the following balances at 2 per cent per annum.

No.	MIN. BALANCE FIRST QUART.	MIN. BALANCE SECOND QUART.	INT. FOR FIRST QUART.	INT. FOR SEC. QUART.	TOTAL INTEREST
1	$235.76	$456.87			
2	876.80	870.00			
3	1,346.87	2,175.35			
4	924.23	909.90			
5	3,450.95	3,874.46			
6	144.48	175.45			

BANK LOANS—INTEREST AND DISCOUNT

If an organization or individual needs money for a short time, it may be borrowed from the bank. As evidence of the existence of the loan, the borrower signs a promissory note. The note specifies the length of time of the loan, and the rate of interest to be paid. The interest may be paid with the amount of loan upon the due date, or the bank may deduct the interest from the amount of the loan, and give the borrower the difference. When this is done, the interest is referred to as discount, and the difference, as proceeds.

EXAMPLE—On June 5, a man borrowed $500 for 3 months at 6 per cent per annum, the discount being deducted. What are the proceeds of the loan?
Discount is $500 × 3/12 × .06 = $7.50
Proceeds are $500 − $7.50 = $492.50

EXERCISE—Record the discount and proceeds for each of the following notes. Complete your calculations on a scratch pad.

No.	AMOUNT OF LOAN	RATE OF DISC'T.	TIME OF LOAN	DISC'T	PRO-CEEDS	No.	AMOUNT OF LOAN	RATE OF DISC'T.	TIME OF LOAN	DISC'T.	PRO-CEEDS
1	$500	6%	90 days			6	$750	6%	3 months		
2	250	5%	60 days			7	1000	7%	6 months		
3	400	6%	30 days			8	900	5%	1 month		
4	275	7%	2 months			9	100	6%	3 months		
5	175	4%	6 months			10	600	6%	2 months		

FUNDAMENTAL OPERATIONS

1. Total the following columns.

1.	2.	3.	4.	5.
1345.56	8795.45	7665.55	7898.78	1178.45
2345.45	1891.34	1890.34	3456.55	2345.56
7898.34	7171.71	3434.34	3232.35	5665.45
7898.22	3456.33	3388.34	7375.37	3478.23
3456.77	7744.33	2334.45	7889.00	2034.56
3456.76	2020.20	2034.40	8080.30	2032.05
8900.35	3555.57	3456.90	2121.27	2728.29

2. Subtract.

1.	2.	3.	3.	5.
6578.56	9876.34	7899.04	3456.76	6780.00
2345.55	8907.77	3278.15	3223.88	5898.10

3. Multiply.

1.	2.	3.	4.	5.
3456.34	1345.56	1123.45	1909.13	2345.65
7	9	6	5	4

4. Divide.

1. 4)6346464 2. 7)15148 3. 9)55044 4. 6)39996 5. 12)14544

5. Complete the following deposit slips.

1.		2.		3.	
11 × $1		78 × $1		187 × $1	
22 × 2		36 × 2		104 × 2	
17 × 5		35 × 5		87 × 5	
24 × 10		34 × 10		61 × 10	
9 × 20		11 × 20		23 × 20	
3 × 50		7 × 50		17 × 50	
Silver	171.34	Silver	345.54	Silver	123.45
Copper	7.78	Copper	11.15	Copper	8.87
Cheques	234.45	Cheques	987.75	Cheques	454.34

6. Calculate the total interest on the following groups of notes.

1. $500 × .05 × 73/365 =
446 × .05 × 146/365 =
644 × .01 × 219/365 =
240 × .06 × 292/365 =
Total

2. $640 × .02 × ¼ =
144 × .02 × ¼ =
888 × .02 × ¼ =
164 × .02 × ¼ =
Total

UNIT 9

WEIGHTS AND MEASURES

Conversion of Units

To convert a measure to smaller units of that measure, multiply according to the table of weights and measures concerned. See Appendix 1.

Example—Express 5 yd., 2 ft., 5 in. in inches.

1 yd. = 3 ft.; 1 ft. = 12 in.; 3 ft. = 36 in.

Method 1

5 yd. = 5 × 36 = 180 in.
2 ft. = 2 × 12 = 24 in.
5 in. = 5 in.
Total = 209 in.

Method 2

5 yd. 2 ft. 5 in.
= 17 ft. 5 in.
= (17 × 12) plus 5 in.
= 209 in.

1. Express each of the following measurements in terms of the smallest unit.

(1) 2 rod, 4 yd., 1 ft.	(2) 2 miles, 200 rods	(3) 20 sq. yd., 5 sq. ft.	(4) 2 acres, 80 sq. rods
(5) 5 cu. yd., 10 cu. ft.	(6) 48 lb., 8 oz.	(7) 5 gal., 1 qt., 1 pt.	(8) 2 cu. ft., 150 cu. in.

2. Using a scratch pad for calculations, express the following measurements as indicated.

(1) 2½ miles = ft.
(2) 4½ acres = sq. yd.
(3) 40 rd., 2 yd. = ft.
(4) 25 bu., 3 pk. = gal.
(5) 8 tons, 3 cwt. = lb.
(6) 8 gal., 2 qt. = pt.
(7) 2 reams, 3 quires = sheets
(8) 1 cu. yd., 8 cu. ft. = cu. ft.
(9) 15 cu. ft., 24 cu. in. = cu. in.

(10) 98 sq. rd = sq. ft.
(11) 2 sq. mile = acres
(12) 8 furlongs = yd.
(13) 2 lb. 6 oz. (avoir.) = gr.
(14) 2 lb. 6 oz. (troy) = gr.
(15) 5 gal. (Can.) = cu. in.
(16) 5 gal. (U.S.) = cu. in.
(17) 6 qts. water weighs = lb.
(18) 3 pk. potatoes weigh = lb.

Conversion of Units

To convert a measure to higher units of the same measure, divide according to the table of weights and measures concerned.

Example—Express 209 inches in the highest possible units.

Method—Divide by 12 to bring to feet; then divide by 3 to bring to yards; etc.

$$\begin{array}{r|l} 12 & 209 \text{ in.} \\ \hline 3 & 17 \text{ ft.—5 in.} \\ \hline & 5 \text{ yd.–2 ft.–5 in.} \end{array}$$

1. Express each of the following measurements in the terms indicated.

(1) 1210 inches to yards	(2) 500 pints to gallons	(3) 1760 oz. to cwt.
(4) 200 sq. ft. to sq. yd.	(5) 25 pints to pecks	(6) 64 qt. to bushels

2. Using a scratch pad for calculations, express the following expressions in the highest possible units.

(1) 16500 lb. =

(2) 175 pt. =

(3) 1400 sheets =

(4) 1000 in. =

(5) 200 fathom =

(6) 1800 ft. =

(7) 3000 cu. in. =

(8) 800 oz. (avoir.) =

(9) 800 oz. (troy) =

(10) 242 sq. yd. =

(11) 1296 sq. in. =

(12) 150 sq. ft. =

(13) 94 cu. ft. =

(14) 2500 lb. =

(15) 140 lb. =

(16) 36 quires =

(17) 483 pints =

(18) 4160 rods =

Addition and Subtraction of Weights and Measures

When adding, express the results in the highest terms possible.

Example—Add:
3 yd., 2 ft., 9 in.
1 yd., 2 ft., 10 in.
4 yd., 4 ft., 19 in. = 5 yd., 2 ft., 7 in.

The 19 in. = 1 ft., 7 in. Bring down the 7 in. and add the 1 ft. in the feet column. This makes 5 feet, which in turn is 1 yd., 2 ft. The 1 yard is then added in the yard column to make 5 yds.

1. Add the following measurements.

(1)
1 yd. 1 ft. 8 in.
2 yd. 2 ft. 9 in.

(2)
10 rd. 3 yd. 2 ft.
5 rd. 1 yd. 1 ft.

(3)
2 gal. 1 qt. 1 pt.
1 gal. 1 qt. 1 pt.

(4)
2 bu. 3 pk. 1 gal.
5 bu. 2 pk. 1 gal.

(5)
1 cwt. 54 lb. 10 oz.
3 cwt. 80 lb. 15 oz.

(6)
6 gro. 2 doz. 10 art.
5 gro. 11 doz. 6 art.

(7)
4 reams 10 quires
5 reams 15 quires

(8)
18 cu. yd. 20 cu. ft.
20 cu. yd. 10 cu. ft.

When subtracting, if the number of units being subtracted is greater than the other number, borrow from the next higher unit.

Example—Subtract:
3 yd., 1 ft., 11 in. change to 2 yd., 4 ft., 11 in.
1 yd., 2 ft., 10 in. 1 yd., 2 ft., 10 in.
1 yd., 2 ft., 1 in.

The 10 inches is easily subtracted from the 11 inches, leaving 1 inch. To subtract the 2 feet from the 1 foot, borrow 1 yard (3 ft.), so that we subtract 2 feet from 4 feet.

2. Subtract the following measurements.

(1)
5 yd. 2 ft. 10 in.
1 yd. 1 ft. 6 in.

(2)
4 yd. 1 ft. 8 in.
1 yd. 2 ft. 4 in.

(3)
3 yd. 2 ft. 6 in.
1 yd. 2 ft. 8 in.

(4)
3 gal. 2 qt. 1 pt.
1 gal. 3 qt. 1 pt.

(5)
20 sq. yd. 5 sq. ft.
2 sq. yd. 7 sq. ft.

(6)
5 acres 120 sq. rd.
2 acres 140 sq. rd.

(7)
10 oz. 15 dwt. 20 gr.
2 oz. 12 dwt. 22 gr.

(8)
14 ton 5 cwt.
5 ton 8 cwt.

(1) Subtract 5 yds. 2 ft. 9 in. from 7 yds. 1 ft. 8 in. Show solution below.
(2) Add 6 gross 3 doz. and 7 pencils to 14 gross 11 doz. and 9 pencils.
(3) Subtract 3 gal. 3 qt. and 1 pt. from 5 gallons.
(4) Add 5 bu. 2 pk. 1 gal. to 7 bu. 1 pk. 1 gal.

(1)	(2)	(3)	(4)

Multiplication and Division of Weights and Measures

MULTIPLICATION—In order to complete the solution, all units must be converted to higher units when possible.

Example— 3 ft., 6 in.
× 5
= 15 ft., 30 in.
= 17 ft., 6 in.
= 5 yd., 2 ft., 6 in.

(1) 5 × 6 in. = 30 in. = 2 ft., 6 in.
(2) 5 × 3 ft. = 15 ft.
(3) 15 ft. plus 2 ft. (from (1) above) = 17 ft.
(4) 17 ft. = 5 yd., 2 ft.

1. Multiply the following measurements.

(1) 2 ft., 9 in. × 6	(2) 4 sq. yd., 6 sq. ft. × 5	(3) 3 bu., 2 pk., 1 gal. × 8	(4) 2 mi., 160 rd. × 10
(5) 2 ton, 10 cwt., 10 lb. × 15	(6) 3 gal., 3 qt., 1 pt. × 12	(7) 6 cu. yd., 9 cu. ft. × 9	(8) 20 acres, 40 sq. rd. × 12

DIVISION—As division proceeds, carry remainders to the next lower unit.

Example—Divide 3 ft., 6 in. by 2.

2| 3 ft., 6 in.
1 ft., 9 in.

(1) 3 ft. divided by 2 leaves a remainder of 1 ft.
(2) Carry the 1 ft. (12 in.) to the next unit, 6 in., making it 18 in. 18 in. divided by 2 = 9 in.

2. Divide the following measurements.

(1) 3 | 5 yd., 2 ft., 9 in.	(2) 9 | 16 mile, 100 rd.	(3) 6 | 7 sq. ft., 5 sq. in.	(4) 10 | 25 bu., 3 pk.
(5) 5 | 18 ton, 15 cwt., 30 lb.	(6) 8 | 17 cwt., 60 lb., 8 oz.	(7) 9 | 28 sq. yd., 3 sq. ft.	(8) 8 | 12 cu. ft., 0 cu. in.

3. Express in the highest units possible.

(1) 84 sq. in. × 16	(2) 15 oz. × 48	(3) 144 pt. × 36.

LOWER UNITS EXPRESSED IN FRACTIONS OF HIGHER UNITS

A lower unit may be expressed as a fraction of a higher unit.

EXAMPLE—Express 9 inches in yards: (1) As a common fraction.
(2) As a decimal fraction.

(1) $36 \text{ in.} = 1 \text{ yd.}$

$$9 \text{ in.} = \frac{9}{36} \text{ yd.} = \frac{1}{4} \text{ yd.}$$

(2) $$\frac{1}{4} \text{ yd.} = 4\overline{)1.00}^{\,.25} = .25 \text{ yd.}$$

1. Express the following measurements as common fractions and as decimal fractions correct to three places of decimals.

(1) 4 inches as yards	(2) 150 pounds as tons	(3) 5 pints as gallons
(4) 216 square inches as square yards	(5) 15 ounces as pounds	(6) 87 sq. ft. as sq. yd.

2. Express the following measurements as indicated.

(1) 10 in. as a fraction of one yard.	
(2) 120 rods as a decimal fraction of one mile.	
(3) 125 pounds as a decimal fraction of one ton.	
(4) 10 pounds of potatoes as a fraction of a bushel.	
(5) 3 pints as a fraction of a bushel.	
(6) 144 cubic inches as a decimal fraction of 1 cu. ft.	
(7) 242 sq. yd. as a fraction of one acre.	
(8) A 10-carat diamond as a fraction of one ounce.	
(9) 1 U.S.A. gallon as a decimal fraction of 1 Canadian gallon.	

Measuring Lumber

To find the number of board feet in a piece of lumber, multiply the length in feet by the width in feet by the thickness in inches.

Example—Find the board feet in a piece of lumber 12 feet long, 4 inches wide and 2 inches thick. This is usually written with the use of symbols as follows:

1 pc. (piece) 2″ × 4″ — 12′ 0″ (″) represents inches. (′) represents feet.

Solution: 2 (thickness in inches) × $\frac{4}{12}$ (width in feet) × 12 (length in feet)

$$2 \times \frac{4}{12} \times 12 = 8 \text{ board feet.}$$

1. Find the number of board feet in each of the following parcels of lumber.

(1) 2 pcs. 1″ × 6″—12′ 0″	(2) 5 pcs. 2″ × 8″—14′ 0″	(3) 18 pcs. 2″ × 4″—16′ 0″
(4) 5 pcs. 2″ × 6″—10′ 0″	(5) 12 pcs. 1″ × 12″—15′ 0″	(6) 24 pcs. 2″ × 12″—12′ 0″

2. Make up the following bills for lumber.

(1)	18 pcs.	2″ × 4″ — 12′ 0″	@	$115.00 per M		
	24 pcs.	2″ × 4″ — 10′ 0″	@	115.00 " "		
	22 pcs.	2″ × 6″ — 16′ 0″	@	130.00 " "		
	40 pcs.	2″ × 8″ — 16′ 0″	@	140.00 " "		
	50 pcs.	2″ × 10″ — 14′ 0″	@	150.00 " "		
	9 pcs.	2″ × 12″ — 12′ 0″	@	150.00 " "		
				Total		

(2)	18 pcs.	White Pine	1″ × 6″ — 14′ 0″	@	$140.00 per M		
	12 pcs.	" "	1″ × 4″ — 12′ 0″	@	120.00 " "		
	14 pcs.	" "	1″ × 8″ — 12′ 0″	@	150.00 " "		
	7 pcs.	" "	1″ × 10″ — 14′ 0″	@	160.00 " "		
	10 pcs.	" "	1″ × 12″ — 12′ 0″	@	160.00 " "		
	3 pcs.	" "	1″ × 5″ — 14′ 0″	@	140.00 " "		
					Total		

Make the following extensions as required and total each exercise.

1.

64 yd. @ 36c per yd.		
58 yd. @ 64c per yd.		
39 yd. @ 45c per yd.		
84 yd. @ 97c per yd.		
78 yd. @ 86c per yd.		

2.

68 lb. @ 45c per lb.		
72 lb. @ 17c per lb.		
38 lb. @ 84c per lb.		
83 lb. @ 98c per lb.		
97 lb. @ 85c per lb.		

3.

3 yd. 2 ft. @ $ .12 per ft.		
5 yd. 1 ft. @ .11 per ft.		
10 yd. 2 ft. @ .09 per ft.		
5 yd. 1 ft. @ .12 per ft.		
15 yd. 2 ft. @ .08 per ft.		

4.

3 lb. 8 oz. @ $ .11 per oz.		
2 lb. 7 oz. @ .09 per oz.		
2 lb. 3 oz. @ .08 per oz.		
4 lb. 10 oz. @ .12 per oz.		
3 lb. 9 oz. @ .09 per oz.		

5.

25 yd. 1 ft. @ $2.33 per yd.		
16 yd. 2 ft. @ 1.24 per yd.		
10 yd. 2 ft. @ 2.36 per yd.		
8 yd. 2 ft. @ 3.75 per yd.		
9 yd. 1 ft. @ 5.30 per yd.		

6.

225 lb. @ $2.60 per cwt.		
418 lb. @ 3.50 per cwt.		
120 lb. @ 2.20 per cwt.		
25 lb. @ 1.80 per cwt.		
180 lb. @ 2.00 per cwt.		

7.

16,250 lb. @ $12.50 per ton		
17,500 lb. @ 14.80 per ton		
19,278 lb. @ 13.50 per ton		
17,676 lb. @ 11.25 per ton		
13,750 lb. @ 12.40 per ton		

8.

8,640 ft. @ $36.00 per M		
6,860 ft. @ 38.75 per M		
12,600 ft. @ 44.00 per M		
6,575 ft. @ 74.50 per M		
9,750 ft. @ 84.00 per M		

UNIT 10

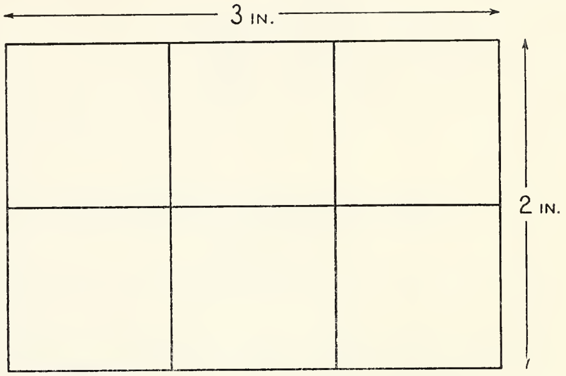
PRACTICAL MEASUREMENTS

Rectangular Areas

A rectangle is a four-sided figure with four right angles and the opposite sides equal and parallel.

A square is a rectangle with all its sides equal.

The figure in the illustration to the right is a rectangle 3 inches long and 2 inches wide. These figures are known as the *dimensions* of the rectangle. Observe that the rectangle is divided into 6 equal squares, each being one square inch in area. The area of the rectangle is therefore 6 square inches.



To find the area of a rectangle, multiply the length by the width, both expressed in the same units of length. Area is expressed in square units; that is, square inches, square feet, etc.

Applying this rule to the above rectangle:

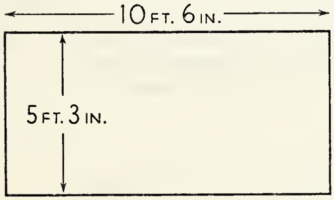
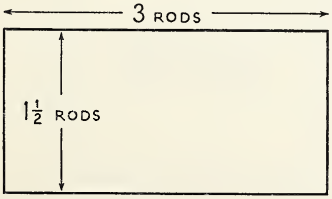
$$\text{Area} = \text{Length} \times \text{width} = 3 \text{ in.} \times 2 \text{ in.} = 6 \text{ sq. in.}$$

This, of course, agrees with the number of inch squares as actually counted.

The *perimeter* of a rectangle—or of any figure—is the distance around it. The perimeter of the above figure in inches is $2 + 3 + 2 + 3 = 10$ in. The perimeter may also be found by multiplying the sum of the width and the length by 2.

$$\text{Perimeter} = 2 \times (\text{length} + \text{width}) = 2 \times (3 + 2) = 2 \times 5 = 10 \text{ in.}$$

Find the perimeter and the area of the following figures according to the dimensions given.

Figure	Solution
1. 	Give answer in feet and square feet.
2. 	Give answer in yards and square yards.

RECTANGULAR AREAS

Find the measurements as required in each of the following exercises.

1. Length, 15 feet; width, 24 feet.
Find (a) Perimeter in yards.
(b) Area in square yards.

2. Length, 12 feet 6 inches; width, 11 feet.
Find (a) Perimeter in feet.
(b) Area in square feet.

3. Length, 2 yards 2 feet; width, 1 yard 1 foot.
Find (a) Perimeter in feet.
(b) Area in square feet.

4. Length, 120 feet; width, 35 feet.
Find (a) Perimeter in yards.
(b) Area in square yards.

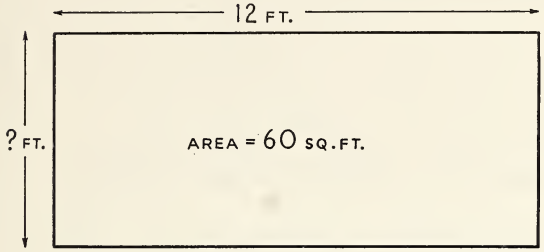
5. Length, 220 yards; width, 110 yards.
Find (a) Perimeter in rods.
(b) Area in acres.

6. Length, 300 yards; width, 100 yards.
Find (a) Perimeter in rods.
(b) Area in acres.

RECTANGULAR DIMENSIONS

If the area and the length of a rectangle are given, divide the area by the given length to obtain the width. See the figure and solution below:

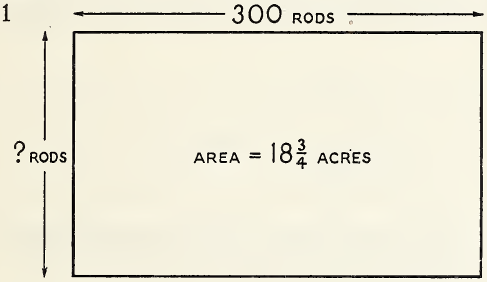
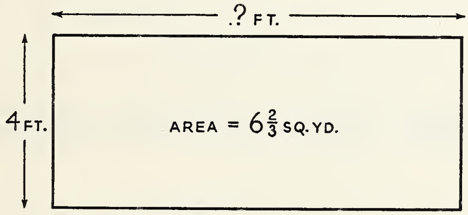
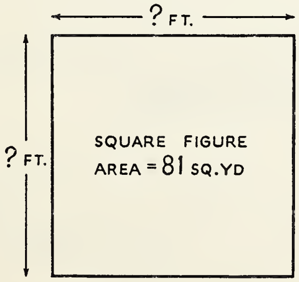
FIGURE



SOLUTION

Length × Width = Area
12 ft. × width = 60 sq. ft.
Width = 60 ÷ 12 = 5 ft.

Find the missing dimensions for the following figures according to the dimensions given.

FIGURE	SOLUTION
.1 	
2. 	
3. 	

PROBLEMS ON RECTANGULAR MEASUREMENTS

Show your solutions for the following problems.

1. How many square yards of carpet would be required to cover a room, 12 feet by 12 feet, wall to wall? What would be the cost at $6 a square yard?

2. A rug, 9 feet by 12 feet, is priced at $6.60 a square yard. What is the cost of the rug?

3. How many pieces of rubber tiling, 9 inches square, will be required to cover a floor which is 12 feet by 9 feet?

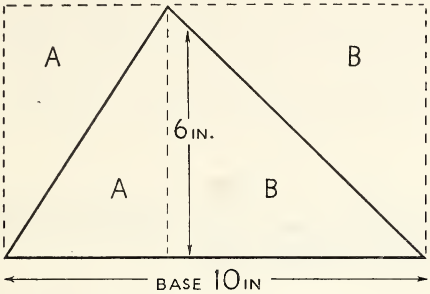
4. If a quart of porch enamel covers 150 square feet, how many quarts will be required to give 2 coats to a floor which is 6 feet, 3 inches by 12 feet?

5. How many quarts of paint would be required to give two coats to the ceilings of 2 rooms, one 13 feet by 14 feet, and the other 15 feet by 12 feet? Assume that one quart covers 160 square feet.

6. How many board feet of lumber 1 inch thick would be required for a floor which is 30 feet by 40 feet. Add an additional 1/10 to cover wastage and shrinkage.

A triangle is a three-sided figure. The area of a triangle is equal to one-half the base multiplied by the height. This can be easily seen in the diagram shown with the example below.

EXAMPLE—Find the area of a triangle, of which the base is 10 inches and the height, 6 inches.

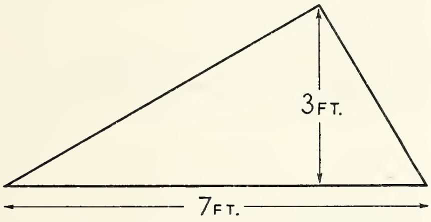


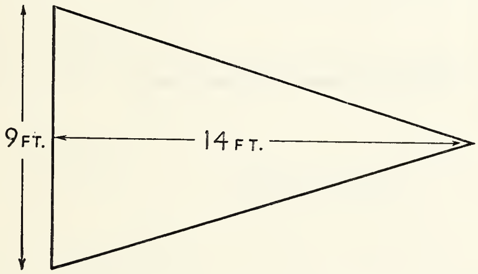
By studying the figure to the left, it will be observed that the sections marked A are equal, and the sections marked B are equal; hence, the triangle is equal to one-half the area of the rectangle.

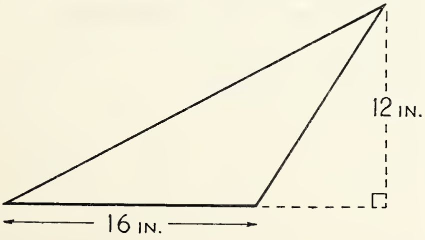
The area of the rectangle = base × height.

Therefore, the area of the triangle
$= \frac{1}{2}$ (base × height)
$= \frac{1}{2}$ (10″ × 6″)
$= \frac{1}{2}$ (60 sq. in.) = 30 sq. in.

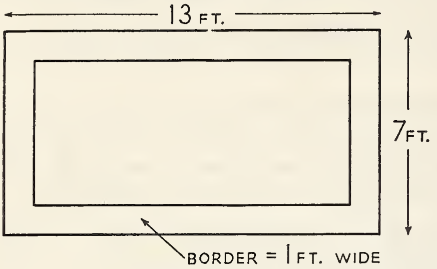
Find the area of the illustrated triangles according to the dimensions given.



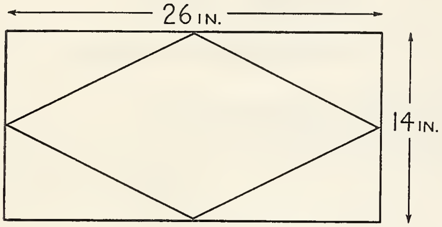




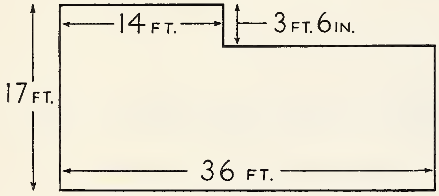
Find the areas of these figures.



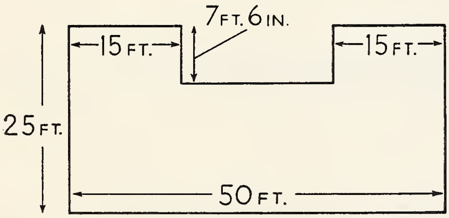
1. Find the area of the border in square feet.



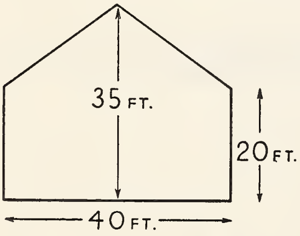
2. Find the area of the diamond-shaped figure in square inches.



3. Find the area in square yards.



4. Find the area in square feet.



5. Find the area of the whole figure.

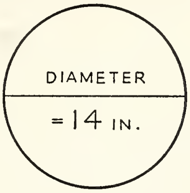
Circumference of a Circle

The perimeter of a circle is called the *circumference.* The *diameter* of a circle is a straight line drawn through the centre, meeting the circumference at both ends. The *radius* of a circle is the distance from the centre to the circumference. The radius is therefore half the diameter.

The length of the circumference of a circle has a fixed relationship to the diameter. In any circle, the circumference will be found to be 3 1/7 times as long as the diameter. The value 3 1/7 is called "Pi" (the 16th letter of the Greek alphabet). This symbol is written π.

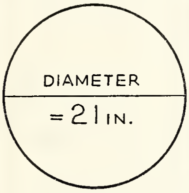
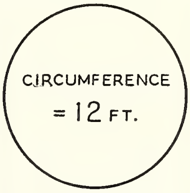
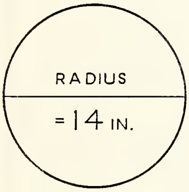
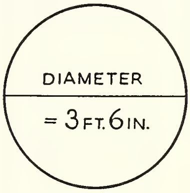
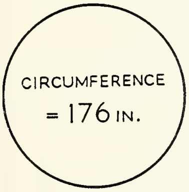
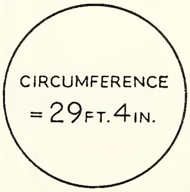
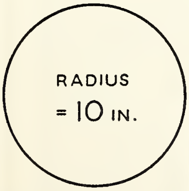
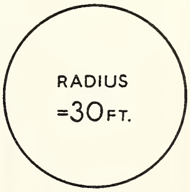
Conversely, the diameter of a circle is the circumference divided by 3 1/7.

Example—Find the circumference of a circle which has a diameter of 14 inches.



$$\begin{aligned}\text{Circumference} &= 3\,1/7 \times \text{Diameter } (\pi d)\\ &= 3\,1/7 \times 14\\ &= \frac{22}{7} \times 14 = 44 \text{ inches}\end{aligned}$$

Find the measurements of the following circles according to the dimensions given.

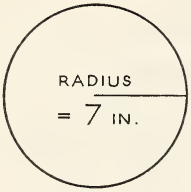
1. 	Find the circumference.	5. 	Find the diameter.
2. 	Find the circumference.	6. 	Find the circumference.
3. 	Find the radius.	7. 	Find the radius.
4. 	Find the circumference.	8. 	Find the circumference.

AREA OF A CIRCLE

The area of a circle is found by the following formula:

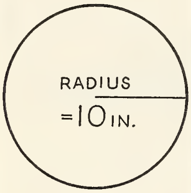
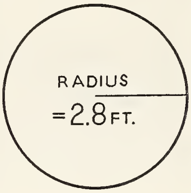
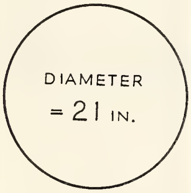
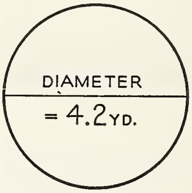
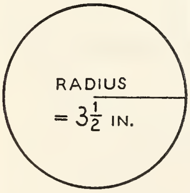
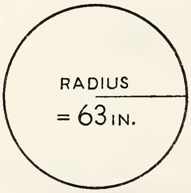
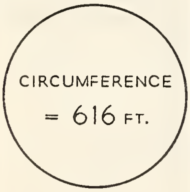
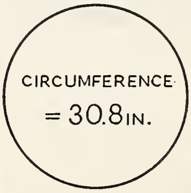
$$\text{Area} = 3\,1/7 \times \text{radius} \times \text{radius} = 3\,1/7 \times \text{radius}^2 = \pi r^2$$

EXAMPLE—Find the area of a circle which has a radius of 7 inches.



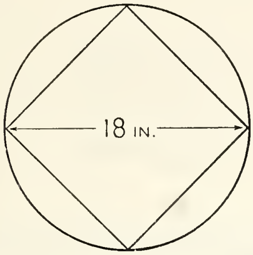
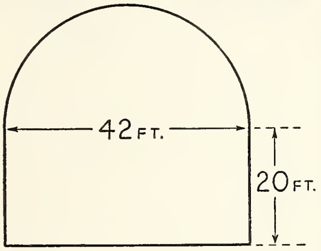
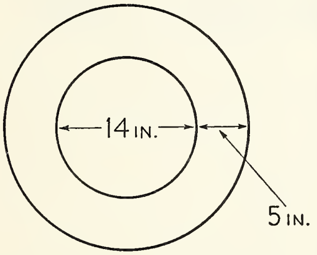
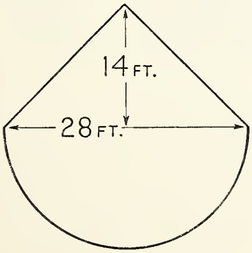
$$\text{Area} = 3\,1/7 \times \text{radius} \times \text{radius}$$
$$= \frac{22}{7} \times 7 \times 7 = 154 \text{ sq. in.}$$

Find the areas of the following circles.

1. 		5. 	
2. 		6. 	
3. 		7. 	
4. 		8. 	

AREAS OF RECTANGLES, TRIANGLES, AND CIRCLES

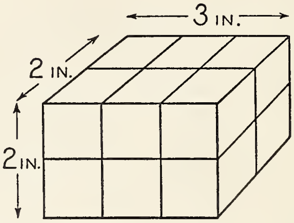
Find the areas of the following figures according to the dimensions given.

1. 	Find the area of the square in the circle.
2. 	Find the total area of the figure illustrated.
3. 	Find the area of the ring between the two circles.
4. 	Find the area of the whole figure illustrated.

VOLUME OF RECTANGULAR SOLIDS

A rectangular solid has length, width, and depth. When the length, width, and depth are all equal, it is called a *cube.* All rectangular solids are expressed in terms of cubes; for example, cubic inches, cubic feet, etc.

The figure to the right represents a rectangular solid, 3 inches long, 2 inches wide, and 2 inches deep. It is divided into cubes, each representing one cubic inch. Counting the cubes reveals that there are 12 cubic inches in the solid.



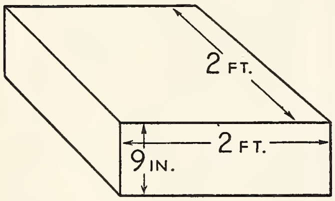
The formula for finding the volume of a rectangular solid is as follows:

Volume = Length × width × depth

By applying this formula to the figure above, we find that the volume is 3″ × 2″ × 2″ or 12 cu. in.

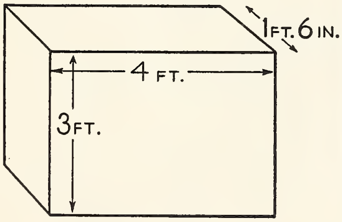
Find the volume of the following figures according to the dimensions given.

1.



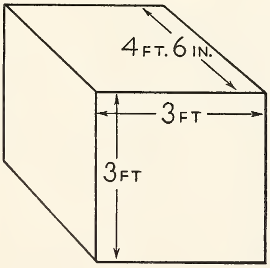
Find the volume in cubic feet.

2.



Find the volume in cubic feet.

3.



Find the volume in cubic yards.

VOLUME OF RECTANGULAR SOLIDS

If the volume of a rectangular solid is given, and any two of the other dimensions are known, the third dimension may be found.

EXAMPLE—A rectangular solid having a volume of 12 cubic inches is 3 inches long and 2 inches wide. Find the depth. (See the illustrative diagram on the preceding page.)

Length × width × depth = volume.
Therefore, 3 in. × 2 in. × depth = 12 cu. in.
That is, 6 sq. in. × depth = 12 cu. in.

$$\text{Therefore, depth} = \frac{12 \text{ cu. in.}}{6 \text{ sq. in.}} = 2 \text{ inches.}$$

Find the measurement required to complete the following dimensions.

1. Length = 3 feet, 8 inches
Width = 4 feet
Depth = 10 inches
Volume = ?

2. Length = ?
Width = 12 feet
Depth = $4\frac{1}{2}$ feet
Volume = 30 cubic yards

3. Length = 10 feet
Width = ?
Depth = 3 feet
Volume = $6\frac{2}{3}$ cubic yards

4. Length = 10 feet
Width = 6 feet
Depth = ? inches
Volume = 10 cubic feet

5. Length = 3 feet
Width = ? feet
Depth = 1 foot
Volume = 54 cubic feet

6. Length = 180 feet
Width = 3 feet
Depth = 8 inches
Volume = ? cubic yards

PROBLEMS ON VOLUME

In the spaces to the right, show the solutions to the following problems.

1. Take the dimensions of your classroom and calculate how many cubic feet of air it contains.
2. How many cubic yards of cement would be required for a driveway 60 feet long, 8 feet wide, and 4 inches deep?
3. How many cubic yards of topsoil, laid one inch deep, would be required to cover a lawn 30 feet by 35 feet? (Find to 2 decimal places.)
4. A coal bin is 7 feet long, 4 feet wide, and 7 feet high. If a ton of coal is approximately $1\frac{1}{2}$ cubic yards in volume, how many tons will the bin hold? (Find to one decimal place.)
5. What would be the cost of excavating for a basement 40 feet long, 24 feet wide, and 5 feet deep at \$2 a cubic yard?

REVIEW ASSIGNMENTS

UNITS 1 to 10

UNIT 1 — FUNDAMENTAL OPERATIONS WITH WHOLE NUMBERS

1. Find the daily and weekly totals, and the grand total for the week.

Daily Attendance in Swimming Pools

POOL	MON.	TUES.	WED.	THURS.	FRI.	SAT.	TOTAL
Forster	510	567	498	537	509	677	
Rotary	690	710	503	871	793	1143	
Kennedy	671	638	601	643	619	476	
Patterson	291	347	273	269	264	311	
Lanspeary	741	729	644	678	637	1241	
Walkerville	603	653	599	583	617	707	
Totals							

2. By how much does the weekly attendance at the pool with the largest attendance exceed that of the pool with the smallest attendance?

3. By how much is the largest daily attendance at all pools greater than the smallest daily attendance?

4. A regular-priced soap sells for 77¢ a package. A "special" lists it at 20¢ off the regular price. If a family uses a package a week, how much is saved if a year's supply is purchased at the sale?

5. A telephone directory has 169 pages. Each page has four columns of 102 names to a column. How many names are listed in the book?

6. A plant offers its employees a 7¢-an-hour increase. If an employee works 44 hours a week 52 weeks a year, how much is his increase (a) per week, (b) per year?

7. A firm divided a surplus of $37,012.90 among 718 employees. How much did each receive?

UNIT 2 — FACTORS

(1) Find the H.C.F. of 360 and 492	(2) Find the H.C.F. of 308 and 392	(3) Find the H.C.F. of 189 and 294

4. Find the L.C.M. in the following.

(1) 64, 32, 80	(2) 18, 21, 15, 36	(3) 18, 20, 16, 24	(4) 45, 21, 35, 28

5. Express as improper fractions.

(1) $3\frac{7}{8}$	(2) $9\frac{3}{8}$	(3) $4\frac{5}{6}$	(4) $12\frac{9}{11}$	(5) $121\frac{7}{8}$	(6) $79\frac{3}{4}$

6. Express as mixed numbers.

(1) $\frac{118}{9}$	(2) $\frac{209}{16}$	(3) $\frac{305}{17}$	(4) $\frac{213}{8}$	(5) $\frac{157}{4}$	(6) $\frac{623}{25}$

7. Express with the same denominator.

(1) $\frac{1}{5}, \frac{1}{6}, \frac{1}{4}, \frac{1}{3}$	(2) $\frac{5}{12}, \frac{7}{18}, \frac{3}{4}, \frac{5}{9}$	(3) $\frac{5}{9}, \frac{5}{18}, \frac{4}{5}, \frac{2}{5}$

UNIT 3 — FRACTIONS

1. Complete the following additions.

(1) $1\frac{5}{6}$ $3\frac{2}{3}$ $4\frac{5}{9}$ $5\frac{7}{12}$ $2\frac{3}{4}$ $4\frac{2}{9}$	(2) $3\frac{1}{16}$ $5\frac{5}{12}$ $4\frac{5}{8}$ $9\frac{11}{32}$ $14\frac{5}{24}$ $7\frac{3}{8}$	(3) $45\frac{9}{32}$ $17\frac{5}{16}$ $26\frac{7}{8}$ $23\frac{29}{64}$ $48\frac{3}{8}$ $11\frac{3}{16}$	(4) $271\frac{2}{3}$ $117\frac{3}{8}$ $219\frac{1}{6}$ $507\frac{5}{12}$ $219\frac{7}{8}$ $101\frac{1}{3}$

2. Complete the following subtractions.

(1) $141\frac{3}{8}$ $-107\frac{1}{4}$	(2) $351\frac{1}{8}$ $-\ 99\frac{5}{12}$	(3) $691\frac{1}{2}$ $-423\frac{2}{3}$	(4) $1171\frac{9}{10}$ $-\ 433\frac{4}{15}$

3. Multiply the following.

(1) $\frac{2}{3}\times\frac{7}{10}\times\frac{15}{16}$	(2) $24\times\frac{3}{8}\times\frac{1}{3}$	(3) $10\frac{1}{2}\times5\frac{2}{3}\times3\frac{1}{7}$	(4) $365\times11\frac{1}{5}$

4. Divide the following.

(1) $\frac{5}{6}$ by $\frac{3}{16}$	(2) $\frac{6}{7}$ by $\frac{1}{7}$	(3) $15\frac{1}{2}$ by 5	(4) $112\frac{1}{3}$ by $16\frac{1}{2}$

5. Simplify the following.

(1) $\frac{1}{3}$ of $9\div(3+2)$	(2) $\left(\frac{1}{2}+\frac{1}{3}\right)\div\frac{1}{7}$ of 28	(3) $\frac{7}{9}$ of $6\frac{1}{2}\div\frac{1}{3}$ of $\frac{5}{9}$

UNIT 4 — DECIMAL FRACTIONS

1. Express as common fractions.

(1)	(2)	(3)	(4)	(5)
.7	.71	.711	.7111	1.7

2. Express as decimals.

(1)	(2)	(3)	(4)	(5)
$\frac{3}{8}$	$\frac{1}{40}$	$5\frac{1}{4}$	$\frac{1}{200}$	$9\frac{7}{25}$

3. Add the following.

(1)	(2)	(3)	(4)
783.46 23.1 47.082 36.0121 127.003	167.150 39. 146.003 14.08 1.005	297.018 41.007 207.771 262.308 16.02	1515.03 361.171 141.032 29.015 671.5

4. Multiply the following.

(1)	(2)	(3)	(4)
236.4 .314	35.016 .023	67.008 1.054	1673.15 .0236

5. Divide the following (correct to 2nd decimal place).

(1)	(2)	(3)
$2.1\overline{)3.003}$	$3.17\overline{)12.9336}$	$.48\overline{)2.9424}$

6. Subtract the following.

(1)	(2)	(3)	(4)
6231.84 219.23	23617.002 10867.435	97.06381 21.07444	15607.001 3165.002

UNIT 5 — PROBLEMS IN PROPORTION

1. A bag of insulation will cover 10 sq. ft. How many bags are required to insulate an attic 24 ft. by 30 ft.?

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2. Mary received twice as many marks in a test as Joe, who received 3/5 of what Allan was given. Compare Mary's marks with Allan's in fractional terms.

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3. Smith's house was worth $3\frac{1}{2}$ times as much as King's. King's house was worth \$3,600. How much was Smith's house worth?

....

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....

4. If 4 men can paint a barn in 9 days, how long will it take 3 men to paint the same barn?

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5. A scout troup had 18 Christmas trees left after the Christmas season. This was $\frac{1}{9}$ of the number they had purchased. How many did they sell?

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6. Martha weighs $\frac{3}{4}$ as much as Susan, who weighs $\frac{7}{8}$ as much as Ruth. Ruth weighs 96 pounds. How much do Martha and Susan weigh, respectively?

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7. A runner can run a mile in 4 minutes. At this speed, how long does it take him to run 10 feet? Give your answer in seconds.

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8. A man inherited \$2400, which was .3 of an estate. A second man inherited $\frac{1}{2}$ of the estate. How much did the second man get?

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Unit 6 — Percentage

1. Express as per cents.

(1) $\frac{3}{4}$	(2) $1\frac{3}{5}$	(3) $\frac{5}{8}$	(4) $4\frac{7}{8}$	(5) $\frac{1}{100}$	(6) $\frac{3}{16}$	(7) $\frac{7}{25}$

2. Express as fractions.

(1) 7%	(2) $37\frac{1}{2}\%$	(3) $187\frac{1}{2}\%$	(4) 110%	(5) 3%	(6) $\frac{1}{8}\%$	(7) $1\frac{1}{4}\%$

3. Express as decimals.

(1) 18%	(2) 5%	(3) 125%	(4) $16\frac{2}{3}\%$	(5) $\frac{1}{8}\%$	(6) $\frac{1}{4}\%$	(7) .75%

4. Calculate.

(1) 3% of $150	(2) 75% of $144	(3) $\frac{1}{8}\%$ of $160	(4) 39% of $45

5. Calculate what percent the first quantity is of the second.

(1) $5 of $30	(2) 3 lb. of 33 lb.	(3) 3 oz. of 16 oz.	(4) 220 yd. of 1 mile

6. Solve the following.

(1) $17.50 is 10% of what sum?	(2) 9 lb. is 5% of what quantity?	(3) 86 miles is 2% of what distance?

UNIT 7 — BUSINESS APPLICATIONS OF PERCENTAGE

1. Goods can be purchased for $220, less a discount of 10%. If paid for within 10 days, a further discount of 2% is allowed. What is the cash cost?

2. What is the selling price of goods costing $15, which are marked up 25% and then marked down 10%?

3. The profit on a sale of goods was $7.00. If this is 10% of the cost, what is the cost? What is the selling price?

4. The loss on a sale of goods was 10% of the selling price, which was $30. What was the cost?

5. Goods costing $15 were sold for $18. (a) What was the gain. (b) What was the gain per cent based on the cost. (c) What was the gain per cent based on the selling price?

6. A man bought 10 chairs for $7.50 each. He marked them up 50% and sold 9 of them. He sold the other for $\frac{1}{3}$ less than cost. What did he gain on the transaction?

7. A firm's sales in 1955 were $310,000. Salaries amounted to $17,050. What per cent were salaries of sales?

8. A firm manufactured 5,000 light bulbs. Of these 250 were defective. What per cent were satisfactory?

UNIT 8 — ARITHMETIC OF BANKING

1. What is the interest on $600 for one month at 6% per annum?

2. What is the interest on $185 for 146 days at 5% per annum?

3. A $5,000 mortgage on a house bears interest at 6% per annum. What is the interest cost per month?

4. A man borrowed $1,000 from the bank for 3 months at 5½% per annum. How much must he repay when the loan is due?

5. What is the amount of the following deposit? 10 $1 bills, 8 $2 bills, 11 $5 bills, 6 $10 bills, $3.50 in coin, and a cheque for $18.50.

6. The interest on bank savings is 2% per annum calculated on the smallest balance in each quarter year, and added on April 30 and Oct. 31. If the minimum balances in the 2 quarters preceding April 30 are $196 and $215, what is the interest to be added on April 30?

7. What is the discount on a loan of $500 for 3 months at 6%?

8. What would be the proceeds of a loan of $750 for 6 months if the discount rate is 7% per annum?

UNIT 9 — WEIGHTS AND MEASURES

1. Express 6 cu. yd., 7 cu. ft. in cu. in.

2. Add.

$$\begin{array}{r} 3 \text{ bu. } 3 \text{ pk. } 1 \text{ gal.} \\ \underline{7 \text{ bu. } 2 \text{ pk. } 1 \text{ gal.}} \end{array}$$

3. Subtract.

$$\begin{array}{r} 5 \text{ yd. } 1 \text{ ft. } 9 \text{ in.} \\ \underline{1 \text{ yd. } 2 \text{ ft. } 11 \text{ in.}} \end{array}$$

4. Multiply.

$$\begin{array}{r} 3 \text{ bu. } 2 \text{ pk. } \frac{1}{2} \text{ gal.} \\ \underline{\times\ 4} \end{array}$$

5. Divide.

$$3\overline{)6 \text{ yd. } 2 \text{ ft. } 6 \text{ in.}}$$

6. Express in highest units possible.
173 pints × 17

7. How many Canadian gallons are there in 150 U.S. gallons?

8. How many acres are there in a lot 300 feet by 600 feet?

9. What is the cost of a sheet of plywood 8 ft. by 4 ft. at $17\frac{1}{2}$ cents a sq. ft.?

10. What is the cost of 10 pieces of lumber 2 in. × 4 in. by 10 ft. long at $175 per M?

UNIT 10 — PRACTICAL MEASUREMENTS

1. What is the perimeter of a room 18 feet by 12½ feet? What is its area?

2. A field 220 rods long contains 110 acres. How wide is it?

3. How many tile 9 inches square are required to floor a kitchen 9 feet by 12 feet? What is the cost at 8¢ a tile?

4. What is the area of a triangle which is 8 feet high with a base of 9 feet?

5. What is the circumference of a circle 28 feet in diameter?

6. What is the area of a circle having a radius of 35 feet? How much larger is the area of a circle having a radius 7 feet longer?

7. How many gallons of water are in a tank 10 feet long by 4 feet wide when the water is 5 feet deep?

8. If a circular race track is 1 mile long, how long would its diameter be? Give your answer in yards.

ROUGH CALCULATIONS

Rough Calculations

ROUGH CALCULATIONS

QA 135 P51 BK-1
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Jan. 29/62.

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Length

12 inches (in.) = 1 foot (ft.)
3 feet = 1 yard (yd.)
5½ yards = 1 rod (rd.)
320 rods = 1 mile (mi.)
1 mile = 1760 yards
1 furlong = 220 yards
1 fathom (used to measure depth at sea) = 6 feet
1 knot = 6080 feet

Area

144 square inches (sq. in.) = 1 sq. foot
9 square feet = 1 sq. yard
30¼ square yards = 1 sq. rod
160 square rods = 1 acre
640 acres = 1 sq. mile
4840 square yards = 1 acre

Volume

1728 cubic inches (cu. in.) = 1 cu. foot
27 cubic feet = 1 cu. yard

1 cord (used in measurin
A cord of wood is 8 fe
4 feet high.

Avoirdu

16 ounces (oz.)
100 pounds
2000 pounds
1 pound
1 ounce
1 long ton

Tro

(used for weighing
24 grains
20 pennyweights (dw
12 ounces

1 lb. Troy
1 oz. Troy
The weight of diamo
(k). 1 carat is abou

The fineness of gold
Thus, 18k gold is 18
the remaining 6/24 l

Liquid Measure

4 gills = 1 pint (pt.)
2 pints = 1 quart (qt.)
4 quarts = 1 gallon (gal.)
6¼ gal. (Can.) in volume = 1 cu. foot (approx.)
1 gal. (Can.) in volume = 277.274 cu. inches
1 gal. (U.S.) in volume = 231 cu. inches
1 gallon water weighs 10 pounds.

Dry Measure

2 pints = 1 quart
4 quarts = 1 gallon
2 gallons = 1 peck (pk.)
4 pecks = 1 bushel (bu.)

Bushels by weight are as follows:

Barley = 48 lb.
Beans = 60 lb.
Beets = 50 lb.
Buckwheat = 48 lb.
Carrots = 50 lb.
Corn = 56 lb.
Oats = 34 lb.
Onions = 50 lb.
Parsnips = 45 lb.
Peas = 60 lb.
Potatoes = 60 lb.
Wheat = 60 lb.

Number

= 1 dozen (doz.)
= 1 gross (gro.)

Paper

= 1 quire
= 1 ream

Angles

= 1 minute
= 1 degree
= 1 circle
= 90 degrees

Lumber

sure of lumber is the board
e the board feet in a piece of
the length in feet by the
d the result by the thickness

r 12 inches wide, 12 feet long
measures 12 board feet.